Vol. XVIII. Part 7.

[Registered at the General Post Office, Melbourne, for transmission by Post as a Newspaper.]

The Journal of the Department of Agriculture of Victoria, Australia.

July, 1920.

PRINCIPAL CONTENTS

Electro-Culture—
A General Review of the Subject

Some Phases of Pooling

Tomato Diseases

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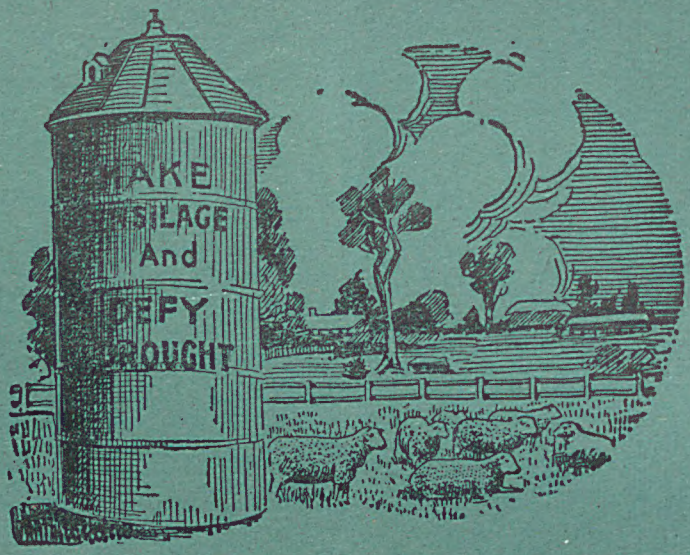

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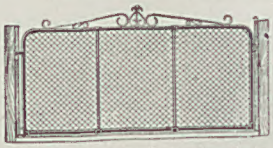


Fig. 112—Cyclone Driveway Gate

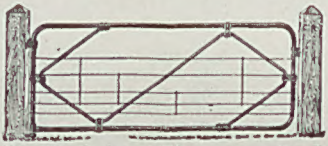
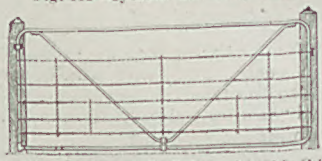


Fig. 201—Cyclone "Z" Ga[illegible] (Registered)



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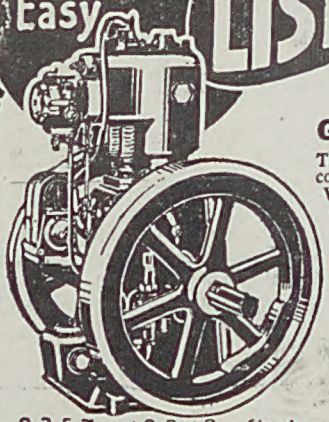

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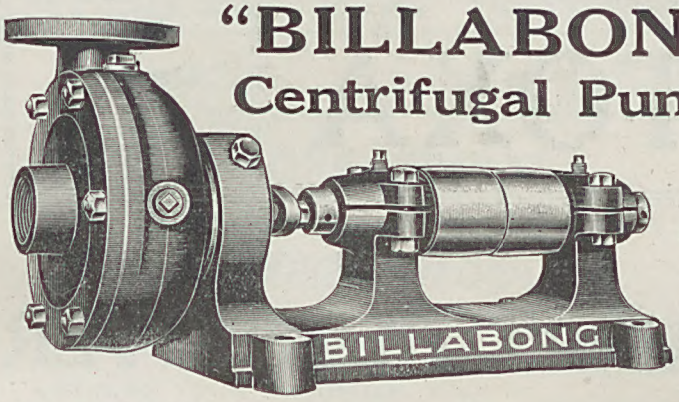

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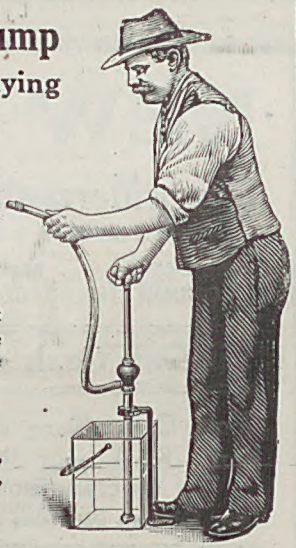

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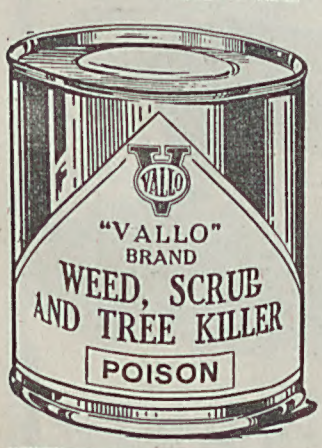

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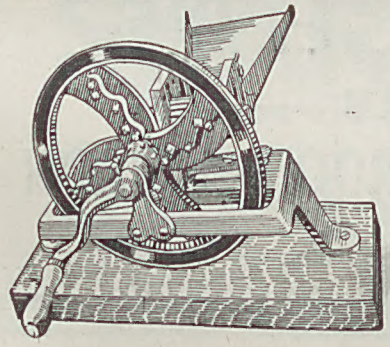

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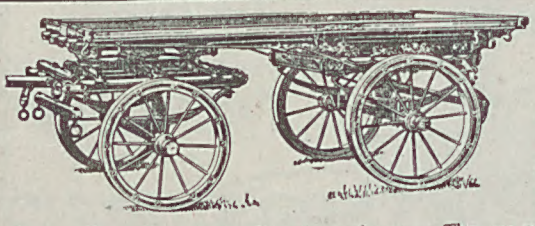

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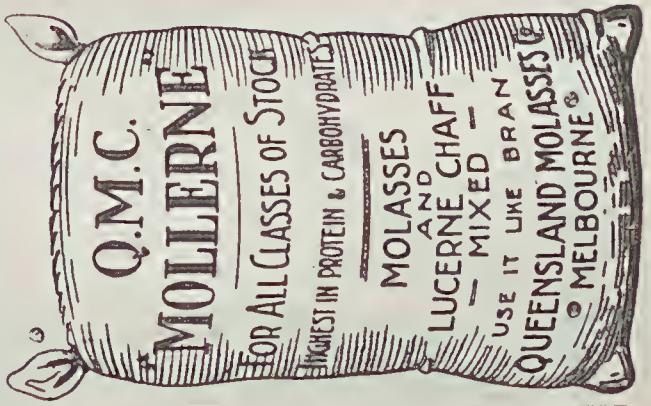

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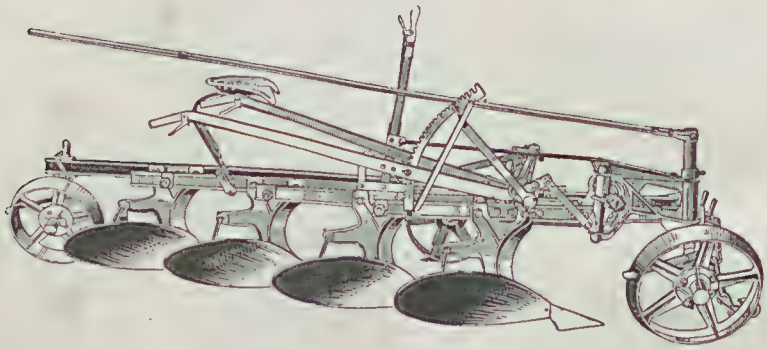

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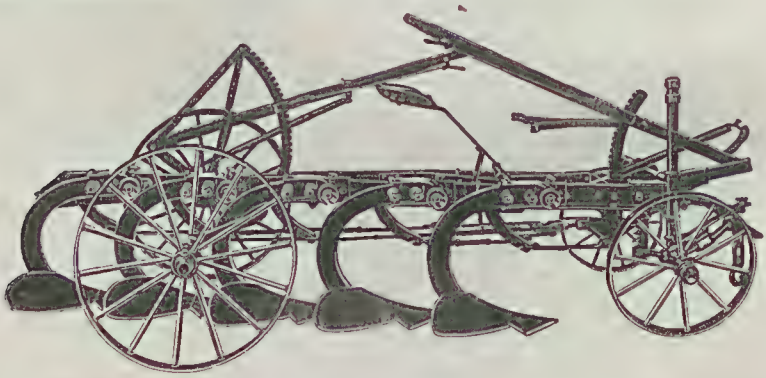

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THE JOURNAL

OF THE

Department of Agriculture

OF

VICTORIA.

Vol. XVIII. 21st July, 1920 Part 7.

ELECTRO-CULTURE.

A GENERAL REVIEW OF THE SUBJECT.

By F. J. Rae, B.Sc., B.Ag. Sc., School of Primary Agriculture, Burnley, Victoria.

At the present moment there is a serious world shortage of foodstuffs and of raw materials. Increase in production, whether by increasing the area under cultivation or by the use of improved methods, is a vital necessity. In the present state of the world's unrest it is highly probable that the shortage will be severely felt for a long time to come, and the maxim that the man who can make two blades of grass grow where one grew before is entitled to rank as a public benefactor, is probably more true to-day than ever before.

While it may not be immediately possible to double the yields from our present areas, still it behoves us to be ever on the alert to take advantage of any development that may tend in the direction of increased production, and it is fitting that serious consideration should be given to any practical proposal for increasing the fertility of the soil. It is with the object of directing attention to a somewhat obscure and little heard of branch of agriculture that the present account of the subject of Electro-culture is written.

Many people have a deep-rooted distrust of what they call "new-fangled ideas," and this, combined with the general lack of knowledge of electricity, has made them slow to examine the results or to take advantage of the benefits claimed for Electro-culture. Thus the matter has been left, and still is in the hands of a few enthusiasts, some of whom have conducted costly experiments for many years with varying success, but always with the indication that greatly increased yields were obtainable if only the electrical stimulus could be applied in the right way.

HISTORICAL.

The idea of stimulating the growth of plants by the use of electricity is not a new one. The earliest known experiments were carried out at Edinburgh by Dr. Mainbray, a Scottish physician, over 160 years ago (1746). Even before this time there seems to have been a popular belief that electrical discharges (thunderstorms) were in some way concerned in stimulating the growth of plants. The general failure of the hop crop in 1787 was attributed, rightly or wrongly, to the almost entire absence of lightning for the season.

Mainbray experimented with young myrtle trees, and demonstrated that electricity accelerated growth. During the next fifty years his experiments were repeated and his observations confirmed by numerous experimenters. The scope of the experiments was gradually enlarged; tests were made with a great variety of plants, and some attempt was made as early as 1747 (the year after Mainbray's experiments) to explain the reasons for the various phenomena observed. The general results recorded were that plants when stimulated by electricity grew more vigorously, had larger leaves, and that they flowered and matured earlier.

In 1783 Berthelon was the first to attempt to apply the use of electricity to the production of crops, and he even went so far as to recommend its use as a remedy for fungus diseases and insect pests. It may be interesting to note at this stage that experiments conducted over 100 years after Berthelon's time, have also demonstrated that crops under the influence of electrical discharge suffer less from the attacks of fungus diseases than others. In this and in other respects Berthelon seems to have been ahead of his time. He also investigated the effect of electrified water on plants, and he electrified seeds by wrapping them individually in tinfoil. He seems to have been the first to consider some of the problems of electro-culture that are engaging most attention at the present time, and which will be discussed later. A quaint old print shows him mounted on an insulated truck being drawn around the garden while he applied electrified water to his plants.

For a period of 100 years after Berthelon's time nothing of outstanding importance seems to have been accomplished, till in 1885 Lemstrom commenced a series of experiments, and became the founder of much of the more modern experimental work in effects of electricity on plant growth. He states that his attention was first directed to the subject by observing the prolific growth of plants during his explorations in high (polar) latitudes. He suspected that this growth was due to the electrical discharges associated with auroral displays, and claimed that the very structure of these plants—needle leaves of the pine and the awns of cereals—fitted them for collecting the current that is known to be passing from the atmosphere to the earth. On his return he began experimenting. His plan was to stretch above the ground a network of wires well insulated from the earth. These wires, which were provided with points making them look somewhat like barbed wire, were highly charged with electricity which escaped from the points across the intervening airspace, through the plants to the soil. This method, though modified by other experimenters (amongst them Sir Oliver Lodge) is still in use.

More recent developments include the electro-chemical treatment of seeds, but this aspect of the subject will be dealt with later on.

MODES OF APPLICATION.

The results that have been collected by all of these experiments have established beyond all doubt that beneficial effects are to be obtained by the application of electrical stimulus to plants or seeds. The big problem is, "*How can this stimulus be most economically and effectively applied?*" The experiments so far conducted fall into classes that differ mainly in the mode of application of the electric current—

(1) Illumination by electric light.
(2) Conduction of atmospheric electricity from elevated conductors to the soil.
(3) Burying plates of copper and zinc in the soil and using the soil as an electrolyte.
(4) Passing a current through the soil from external sources.
(5) Silent discharge from antennæ or overhead network.
(6) Electro-chemical treatment of seeds.

These classes simply represent the different methods used by various experimenters in their attempts to apply electrical stimulus to plants or seeds. A brief account of each of these methods may prove of interest. It is, of course, impossible in a brief review of this description to enter into a discussion of the precise details of the experiments. The results achieved are our chief concern. The use of technical language has as far as possible been avoided.

(1) Illumination by Electric Light.

Experiments in this direction were commenced soon after the discovery of the electric arc light, and many curious results were observed. It was soon discovered that the naked arc light caused damage to plants, but when screened by a transparent glass screen the harmful effects were removed, and very beneficial results obtained.

The effect of the glass screen or a glass globe was to cut out the harmful rays. Numerous other forms of electric light, such as the incandescent electric light, &c., have been tried, and, generally speaking, the results have been good, though all plants are not similarly affected. The use of lights on a big scale is not practicable, so that its application has been restricted to market garden and greenhouse plants. Rawson —a Boston market gardener—has used electric light in raising lettuces for many years with great success. Lights of various colours have also been tried, and the development of produce can be hastened or retarded by their use.

The results obtained at the West Virginia Experimental Station may be summed up as follows (Bulletin 37):—

(i) Electric light is beneficial to some plants for foliage—lettuce.
(ii) Leaves of deeper green.
(iii) Flowers bloomed earlier and longer and were of deeper colour.
(iv) Some plants tend to run to seed—spinach.
(v) Does not benefit all plants equally.

It is claimed that electric light is to be regarded as a valuable asset in the forcing of market garden and greenhouse produce, and in producing fruits and flowers out of season. Mr. Lunt, of Spreydon, New Zealand, has used electric light in his glasshouse for raising tomatoes.

Light used from 9 p.m. to 5 a.m. gave beneficial effect on quantity, quality, and recovery from frost-bite. Apart from the stimulating effect of the light itself there is the factor of warmth associated with the light. Attempts have therefore been made to use electric lights with the object of preventing damage by frost. This is only possible where current is readily available at a low rate, as is the case where hydro-electric schemes have been carried out. The experience of Mr. Farr, orchardist at Fendalton, New Zealand, in this respect is interesting. In his pear and apple orchard he placed a 250-watt radiator in each tree with the object of preventing damage by frost. Frost-bite was prevented, and though there was no increased yield of pears the apples produced an abnormally heavy crop, and were ready for market a fortnight earlier than those in adjacent orchards.—*Journal of Agriculture,* New Zealand, vol. xv., p. 185.

It was while engaged in investigating the effect of electric light on plants that Dr. C. W. Siemans (England) originated the term "Electro-Horticulture," which is still generally used for work of this description, though the wider term "Electro-culture" is now used to embrace the application of electricity in any way to the production of any sort of plant.

Writers in our daily papers occasionally draw attention to the abnormal behaviour of some plant or tree putting out leaves, &c., at some unusual season when situated within the sphere of influence of some street light. It is possible that such behaviour is in a measure due to the influence of the light.

(2) Conduction of Atmospheric Electricity from Elevated Conductors to the Soil.

Attempts to make use of atmospheric electricity by collecting it by means of elevated conductors for discharge either directly into the soil or from an overhead system of wires, seem to have been confined mainly to France. The possibilities of utilizing atmospheric electricity, and even the part that it undoubtedly plays in influencing plant growth, have never been adequately investigated, and little is known about the subject. That such an influence does exist was proved by Grandeau (1879) when he demonstrated that plants protected from atmospheric electricity had their development much retarded. A big field for research is left practically untouched. However, some experiments have been carried out. The general method employed is to attach a conductor to a tall tower, and to connect this with buried plates or networks of wire. Few accounts of these experiments are available, so that it is only possible to refer to them in passing. The cost of the installation would be considerable, and large increases would be necessary to justify the expense. The following results are recorded by F. Paulin, a French experimenter:—

(i) Increased per cent. germination.
(ii) Potatoes, 50 per cent. increase.
(iii) Cauliflowers, matured one month early.
(iv) Beans and peas, 200 per cent. increase.

Experimental Station Record, vol. xv., p. 361.

A cheaper method said to be very effective is to plant numerous metal stakes several feet long all over the field to act instead of one tall conductor. In the absence of details it is impossible to comment on the results beyond stating that further experimental work would be amply justified, though G. F. Lees, writing in the *World's Work* (England), February, 1919, does not regard the system as practicable.

(3) Burying Plates of Copper and Zinc in the Soil, and Using the Soil as an Electrolyte.

This method, if it has nothing else, has at least cheapness and simplicity to recommend it. The writer has been able to discover very few references to it, but the most important of these are quoted below.

In 1844 an American named Ross read a paper before the New York Farmers' Club describing his experiments. He buried a copper plate 5 feet long by 14 inches wide at one end of a plot and a similar plate of zinc at the other end 200 yards away. These plates were connected by an insulated overhead wire. The plot was thus made to act as a galvanic cell—the current flowing round the circuit when the wire was connected. He claimed an increased yield of 50 per cent. of potatoes. Numerous other experimenters got contradictory results, and the matter does not appear to have received any extended attention. However, recent experiments show that increased yields of vegetables are obtainable by this means. (J. W. Crow—Annual Report Ontario Agricultural College and Experimental Farm 34, 1908, page 150).

So little expense or time or trouble is involved that gardeners should be tempted to make a trial for themselves in a small, well-manured plot with smaller plates. Galvanized iron could be used instead of zinc.

(4) Passing a Current through the Soil from External Sources.

This was the method adopted by Mainbray in his original experiments, and his example was followed by many of the earlier experimenters. The process seems to have been rather overshadowed by the development of other systems which apparently gave better results. In 1894 C. Flammarion reported having stimulated the growth of beans by placing them between electrodes connected with a Leclanche cell (ordinarily used for electric bells, &c.).—Experimental Station Record xiv., page 548.

No very striking success seems to have been obtained by this method, but more recent results would indicate that it still has possibilities. Good results have been obtained by the use of carbon electrodes instead of ones of metal, and also by dusting the seed with fine metallic filings before sowing. There is some resemblance here to the method adopted by Berthelon, in 1783, when he wrapped seeds in tinfoil and electrified them before planting. Generally speaking, the results obtained by passing currents through the soil have not been promising. This phase of the problem does not seem to have been as thoroughly investigated as others, but the latest developments would indicate the possibility of valuable results being obtained from the experimental work in hand.

(5) Silent Discharge from Antennae or Overhead Network of Wire.

This method of applying electrical stimulus to growing plants was greatly developed by Lemstrom (1885) though attempts had been made to use it long before his time. The system is of great importance, because it is the one that has claimed most attention ever since.

Lemstrom's work gave rise to a great number of experiments, some of which are still in progress. Subsequent experimenters modified his methods greatly, but the general principles remain the same. It is known that the atmosphere is charged with variable quantities of electricity, and that the charge is continually leaking away to the ground through the plants. The charge is very variable, being small in normal weather, but increasing with thundery conditions, when the leakage becomes correspondingly greater. In the system under consideration there is spread over the plants a network of fine wire so highly charged with electricity that it is discharged into the air, and increases the current passing from the air to the plant to about ten thousand times its normal value.

The current used may be derived from various sources, *e.g.*—

(*a*) Atmospheric electricity.
(*b*) Dynamos driven by small engines.
(*c*) Town supplies.

The use of atmospheric electricity in this respect has been largely confined to continental countries, and experiments are still in progress. Reports of the experiments of Berthelot (distinct from Berthelon) at Heudon and of Basty at Tours (France) state that beneficial effects were obtained in all cases (E.S.R. xx., page 1124). Experiments have also been carried out in Italy, but apart from some experiments by Foster (England) as early as 1844, the use of atmospheric electricity has been neglected in English-speaking countries. Foster conducted the current derived from the atmosphere to wires spread over a crop of barley, and claimed that he had obtained a greatly increased yield.

The greatest development, however, has taken place in the use of dynamos and of town supplies as the source of the current. The general method is to pass the current through the primary of a coil, and by this means to produce a high tension current in the secondary, but this current is alternating in character—going first in one direction and then in the other. By means of specially designed valves the current is allowed to pass in one direction only, and the alterations are eliminated. Thus a potential of about 100,000 volts is kept up in the overhead wires, causing them to glow in the dark, and to discharge with a slight hissing noise. Great care has to be taken with the insulation of the wires from the ground.

The equipment is costly, and the wires are a hindrance to farm operations. Mr. Britton, experimenting at Chester, estimates the cost of an installation for 24 acres at £300, with an annual upkeep of £63, while a system for 300 acres would cost £1,500. This estimate was made in 1917, and the cost would be a great deal higher at the present time. (*Engineer*, vol. 124, page 74).

From this it will be seen that experimental work is greatly hampered by the fact that a cheap and effective type of apparatus is not yet available.

In spite of the heavy costs a great number of experiments are still in progress, and the results are sufficiently striking to justify a great deal more investigation. It has only recently been discovered that the effect of the discharge is not confined to the area under the wires. It extends 30-40 yards on either side in calm weather, but if the weather is windy the influence extends several hundred yards down wind. The control areas cannot therefore be placed within hundreds of yards of the experimental plot. In some of the earlier work the control areas were affected by the discharge, and much contradictory evidence was obtained. The Board of Agriculture (England) has investigated the matter, and the results obtained by reliable experimenters can scarcely be questioned. Some of the results are quoted below—

S. E. Britton, Chester, England (1918).

Increase in yield of potatoes, 150 per cent.

Electrical World, vol. 73, p. 783.

Miss Dudgeon, Lincluden, Dumfries (1916).

Increased weight of grain, 49 per cent.

Increased weight of straw, 88 per cent.

Kind of crop not stated.

Engineer, vol. 123, p. 450.

Potatoes—

Variety.	Increase per acre.
Ringleader	2 tons 4 cwt.
Windsor Castle	1 ton 17 cwt.
Golden Wonder	13 cwt.
Great Scott	1 ton 10 cwt.

Cost of application, £4 7s. 6d.; area 8 acres. Tubers ready a week earlier.

Journal Board of Agriculture (Eng), vol. 23, p. 671.

P. Van Biervliet, Pringsheim, Germany (1904).

Increase for strawberries ..	125	per cent.
Increase for barley	32	„
Increase for beet	119	„
Increase for beans	30	„

Experimental Station Record xvi., p. 557.

Newman, Salford Priors, Evesham (1906-1911).

Area, 19½ acres.

Increase for wheat	20	per cent.
Increase for barley	5	„
Increase for mangolds	25	„

Engineer, vol. 124, p. 74 (1917).

The great majority of the experiments have yielded highly encouraging results, but a number of cases have occurred in which the results have been disappointing, and in which the increased yield was not sufficient to justify the expense of application. It is generally agreed that, before the system can be recommended, more knowledge is necessary on many points. The most suitable strength of discharge is not yet known, and the manurial conditions and the effects on different types of soil are not understood. Experiments are still in progress with the object of throwing more light on to these points.

The assumption underlying the work is that the passage of a small electric current through the plant is beneficial to it, and tends to increase the yield and very often to lessen the time in which that yield is obtainable. It is thought that there is an optimal value for each special plant concerned, and that this value is variable for different plants, and even for the same plant at different stages of its development. Currents in excess of these optimum values will cause harm. Electrified plants transpire more water, and are therefore liable to suffer if treatment is continued in dry weather. The disease-resisting power of a plant is largely a function of its vitality—the more virile plants escaping disease. Numerous experimenters have observed that electrified plants were freer from fungus diseases than others in the vicinity. Another advantage claimed is that the succeeding crop is also greater. In addition, there are important differences in the quality of the crop—cereals showing a higher percentage of nitrogen compounds, and beets an increase in sugar content. The experiments have until recently aroused little more than local interest. About 1910, Professor Breslauer (a German), visited Mr. Newman's installation at Evesham, and was struck by the significance of the experiments. Having secured the agency for the apparatus, he very soon sent in more orders for sets than there had been inquiries in England. Six sets of the Lodge-Newman apparatus were delivered and installed in various parts of Germany. Reports say that good results followed. Though excellent results have been obtained from this method, the lack of precise and definite knowledge on many points leads to the conclusion that there is not yet a sufficiently strong case to warrant the general application of this method to crop production. It is already known that dry conditions are quite unsuitable for its successful working, and this in itself would be a powerful argument against its adoption except in special cases in Australia.

(6) Electro-Chemical Treatment of Seeds.

Recent developments in this phase of electro-culture indicate that it is in this direction that we may expect the most practical developments to take place. It is rather difficult to trace the history of the subject, and it is probable that the work of many of the pioneers did not receive much publicity. Some credit is due to the old experimenter, Berthelon, who electrified seeds by wrapping them in tinfoil. His treatment was not electro-chemical; still he arrived at the same result—electrified seeds—by a different process.

One of the foremost workers along this line of development is Mr. H. E. Fry (Dorset), whose work has recently attracted a great deal of

attention. The method adopted is to pass a current through a solution in which the seeds are immersed. The solution is then drained off, and the seeds dried and sown within a month. Details of current, solution, &c., are not disclosed. Mr. Fry started by sowing seeds in pots, and later in a garden plot. He had some difficulty in persuading a neighbouring farmer to plant some treated seed. The results were so striking that they attracted the attention of other farmers, and in 1918 over 2,000 acres embracing all types of soil were sown with electrified seeds by 500 farmers. The increase in yield ranged from 6 bushels up to 16 bushels to the acre. The British Board of Agriculture investigated the matter, and reaped, threshed, and weighed samples of the crops, and found an average increase of 10.5 bushels per acre to the credit of the electrified seed. The average gain per acre of eleven farmers, after deducting the cost of treatment, was £4 13s. These figures are so extraordinary as to cause doubts as to their correctness, but they can be accepted without the slightest hesitation, coming, as they do, from the British Board of Agriculture, and from experts, representing various agricultural societies, who supervised the work.

Not only was the yield vastly increased, but the quality of the grain was superior. The bushel weighed from 1 to 4 lbs. heavier, was of better milling quality, and produced less offal and more flour.

An even more important effect is to be found in the increase of resistance to rust and other fungus diseases. This was also observable with the use of the overhead discharge already noted. There was also an increase in the quantity and quality of the straw, which tillered out better, and was invariably longer, stouter, and stronger, and less liable to be blown down by storms. It seems to be a very extraordinary thing that the mere passing of an electric current through a solution containing the seeds should so profoundly affect their vital functions as to stimulate germination, growth, resistance to disease, earliness of maturity, and even to modify the quality of the grain and straw produced.

A great deal of experimental work is still necessary, and the proper treatment for each kind of seed and for each type of soil can only be determined by long series of experiments through a period of years. Even with the present knowledge the process can be regarded as established in England. The officer in charge of American interests in Great Britain after a tour of inspection advised his Government to have immediate trials made in every State of the Union.

The cost of the apparatus required is not great, and its handling is very simple. The system devised by Mr. Fry is known as the Wolfryn process, and is protected by patent rights.

Experiments were carried out by a Mr. Butterworth in South Australia years before Fry started to work. He obtained striking results, and planted out a considerable area with treated wheat. Mr. Butterworth died before the crop was harvested, and the results are not known. Mr. Chas. Barclay, Corney Point, South Australia, is also said to have increased his yield 40 per cent. on 60 acres, but no further results are available. Experiments were also carried out at the Hawkesbury Agricultural College by passing a current through the ordinary

copper sulphate pickling solution. Though Mr. Fry's work has attracted so much attention as opening up a new phase of the subject, it must not be forgotten that he was preceded by many years by several Australian experimenters.

The attention of those interested in the subject is directed to a full-page article in the *Sydney Mail,* 25th February, 1920. It gives an account of results obtained by a correspondent in experiments with various vegetables. It also mentions the case of a lady experimenter in Queensland who used a current generated by running the lighting gear on her car. A further account of the subject appears in the February number of the *Journal of the Institute of Science and Industry.* Numerous inquiries have been made for information as to the solution to be used and its strength, the time of application of the current and its strength, but an exhaustive search through the literature bearing on the subject does not disclose these details so that those desirous of experimenting must either wait till details are available or start off as original experimenters. Experiments are at present being conducted at the Burnley School of Horticulture and Primary Agriculture.

A book—*A Manual of Electro-Chemical Treatment of Seeds,* by Dr. C. L. Mercier—is at present in course of publication, and it is expected that when it is available* it will disclose the details of the process.

EXPLANATION OF RESULTS.

Some attempt was made in 1747 to explain the results obtained by Dr. Mainbray in the preceding year. While many of the observations made since then are undoubtedly correct, it cannot be said that any satisfactory explanation has yet been put forward. The electric stimulus causes increased transpiration from plants and fruits, hence early observers ascribed the results to the accelerated motion of the cell sap through the plants. Others consider that electricity renders certain soil constituents more soluble, but this neglects the fact that seeds can be stimulated apart from the soil.

Bains, in a recent work, concludes that the use of low electro-motive forces in agriculture and floriculture is in accord with natural laws, as these currents are always flowing, and slight increases applied in the right way at the right time may result in some benefit.

Other recent observers ascribe the result to increased aeration of the soil, the production of minute quantities of nitric acid and the stimulation of bacterial activity. None of these factors would be operative in the case of electro-chemically treated seeds.

It must be remembered that we are applying a very little understood force to an organism the interior and essential processes of which are still largely unknown to us. The outstanding fact seems to be that electricity, provided the current is not too great, no matter what its source may be, and no matter what mode of application is adopted, exercises a stimulating effect on germination, growth, and maturing of plants, but the reasons for it are mainly shrouded in mystery.

* This book is now available.

SOME PHASES OF POOLING.*

By R. Crowe, Exports Superintendent.

During the last few years pooling of primary products has been adopted more or less throughout the whole civilized world. Circumstances arising out of the war justified this method of dealing for the time being. It might have been impossible to have arranged for the sale of our surplus wool, grain, dairy produce, meat, &c., without bringing into existence organizations with which every one is now familiar, some of whch appear to have taken root.

The time is now ripe to consider the subject generally and in detail. If it has been found advantageous in any respect, the system should be continued, and if proved harmful or even unnecessary, then the sooner it is dropped the better. Of course, it may be desirable to continue pooling for a time, or perhaps altogether, with one commodity, and less desirable, or even pernicious, with other classes of goods.

There are many phases of pooling, and certain forms of it would, I consider, benefit primary producers if put into operation. For instance, in Canada, the wheat is pooled when it reaches the silos, and store warrants given the producer according to the grade of wheat delivered. It is likely that in time pooling of this kind will become more general, the world over. It would be an advantage, too, if fruit-growers pooled their fruit for export.

I have no doubt of the necessity for establishing export packing depôts in every large fruit-growing centre, where, for example, all the Jonathans could be graded according to quality and size, packed and sent away under the name of the district or registered brand. Likewise with other varieties. If this were done, higher prices would be realized in the export markets, and thus each and every fruit-grower concerned would benefit. To give some idea of what is meant, reference may be made to the first shipment this past season. The s.s. *Borda* took a total of 50,000 cases, under *260 different brands.* With a co-operative pooling system such as has been adopted by the Californian Fruit Growers' Exchange and the Western Pacific Exchange, the major portion of this shipment could have been shipped under about ten brands, and under normal conditions higher prices would be realized.

However, it is not these aspects of pooling that I especially desire to bring under your notice just now. You are all well aware of the persistent efforts recently made in all the States of the Commonwealth to maintain pooling in some form or another in connexion with the export and sale of the surplus dairy produce of Australia.

Disadvantages of Pooling Butter.

At the Conference of the Butter and Cheese Factory Managers' Association in 1918, I pointed out that by pooling the surplus butter of the Commonwealth for export to the Imperial Government and fixing the local price at an almost uniform level the year round, winter dairying was discouraged.

* Paper read at the Convention of the Chamber of Agriculture at Port Fairy, 24th June, 1920.

To produce butter in the winter time involved the cultivation of land, purchase of seed, harvesting of fodder crops, and labour in feeding cows. Furthermore, cows artificially fed in the winter did not give as good a yield as when producing in the spring and summer. The work of dairying in cold, wet weather, when the days were short, was not attractive, and it cost anything from 50 to 100 per cent. more to produce each pound of butter at that time of the year as it did in the spring months. Consequently, dairymen altered their former policy of leaving some of the cows to come into milk in the winter, and arranged matters so as to bring as many of their cows as possible into full profit in the early spring, and thus get the best return during the most favorable season of the year. They also refrained from the cultivation of fodder crops for winter dairying.

At the 1919 Conference, this phase of the industry was further enlarged upon, and I stated that owing to the control and regulation of prices of dairy products as compared with other primary industries, land that was previously used for dairying had been largely diverted to the production of meat, wool, and other more profitable uses.

It appears that this transformation is not confined to Victoria, as the following figures will show:—

In 1911-12 there was a surplus of 45,000 tons of butter exported from the Commonwealth after fully supplying local requirements;

In 1917-18 the surplus exported was 31,500 tons;

In 1918-19 the surplus exported was 16,400 tons;

and for this season, 1919-20, it will be little more than 8,850 tons.

The less favorable seasons are to some extent accountable for the falling off, and to a very minor extent the diversion of milk into condensed, concentrated, and dried form is responsible. The chief cause is due to the utilization of land formerly used for dairying for more profitable purposes.

As compared with pre-war times, the price of butter is high, and generally considered satisfactory. It must be remembered that the prices of everything else are also high, and if a farmer can make a more profitable use of his land than by dairying, it is folly to devise means of stopping him from doing so.

It is becoming more universally recognised that no one section should be singled out for control and regulation to their disadvantage in order to benefit the rest of the community, and if price-fixing is to become the order of the day, it should be made to apply all round. Such a policy, however, would involve the cutting off of essential supplies which perhaps could not be made to yield their cost of production, and imported commodities would be particularly affected. It would be futile to approach the English, American, or Japanese manufacturer for commodities at a fixed percentage above pre-war rates, if such manufacturers could dispose of their whole production elsewhere at the present world's market prices.

Pooling as it Affects Victoria.

It is not generally recognised that Victoria enjoys a more natural season for production than any of the other States of the Commonwealth. Usually, the spring arrives in August-September, with a

growing surplus above local requirements. Some of this early surplus has to be sent to the northern States regularly every year to meet their shortage, and export overseas immediately follows. The peak of the season occurs in the month of November, after which production gradually declines, until the export season ends about March.

With New South Wales the height of the season is experienced a month or six weeks later; whilst in Queensland, the new season's surplus butter is available still later, and the height of the season there is not reached until after the New Year—and sometimes as late as February and even March.

This means that the Victorian exports more naturally, or seasonably, meet the time of greatest scarcity in the United Kingdom when prices are highest. New South Wales does not enjoy such a high range of values owing to meeting a falling market; Queensland fares still worse in this respect. The exports from that State frequently overlap the heavy spring supply of dairying countries in the Northern Hemisphere when prices are at their lowest level. It has been found in normal years more profitable to store the surplus in Queensland at the end of the season till the beginning of the next export season.

Taking the exports to the United Kingdom from the three States named for the seasons 1911-12, 1912-13, and 1913-14, and applying the ruling price periodically for deliveries on the United Kingdom market from each State, it will be found that if the butter had been pooled, as has been done for the last few years, Victorian producers would have lost £77,000 for the three seasons mentioned, and the northern States (chiefly, Queensland) would have been the gainers to the extent of £77,000.

The earlier season of production in Victoria for the three seasons prior to the war gave producers of this State an advantage of more than £25,000 per annum over the northern States. It is therefore not a matter for surprise that the northern States have fallen in with the proposal for a continuance of the pooling system, but it would be astonishing indeed if the Victorian dairymen agreed to the suggestion.

The trade in tinned butter for the East is catered for chiefly by Victoria, notwithstanding the fact that the northern States of New South Wales and Queensland are more favourably situated geographically, and have the further advantage of a better steamer service and marketing facilities through the Burns-Philp organization, whose steamers do not lift produce at Melbourne.

The tinned butter trade was developed by the enterprise of Victorian exporters, and continues to be held by them.

About 84 per cent. of the butter exported in tins is shipped from Victoria, and for a considerable time past 2d. per lb. more has been received for such butter above the cost of tins and preparation than for other export butter. Producers have had that advantage intercepted, as the increased price had to be paid into the Pool, and it is not yet very clear whether Victorian producers will receive the large percentage of the distribution which they are entitled to enjoy.

Some time ago a proposal was made to standardize the butter of the Commonwealth by providing for one quality similar to that in Denmark, and the nationalization of the product by the adoption of a national brand. This meant one standard and one brand for Australian butter.

Now, if standardization were intended to apply to composition, it might be pointed out that it is already provided for in the Commerce Regulations which have been in operation for the last fourteen years. Such being the case, it must have been meant to apply to quality only.

The following table gives particulars of the quality of butter exported from Victoria for twelve years, and it enables any one to see what such a proposal would mean. It was not mentioned where the minimum line was to be drawn. If at 92 points, then 42 per cent. of butter previously exported would have been condemned as not being eligible for the export trade. Should it be at 90 points, the percentage would be 20 per cent.; and, if drawn at 88 points, 12 per cent.:—

Grade.	No. Boxes.	Percentage.	
Superfine, 99	4,226	0·07	
,, 98	162,729	2·66	
,, 97	226,993	3·71	
,, 96	315,530	5·16	
,, 95	609,596	9·96	
	1,319,074		21.56%
1st Grade, 94	693,810	11·33	
,, 93	730,802	11·93	
,, 92	822,649	13·43	
,, 91	675,723	11·04	
,, 90	632,135	10·32	
	3,555,119		58.05%
2nd Grade, 89	242,177	3·95	
,, 88	292,931	4·79	
,, 87	183,668	2·99	
,, 86	123,787	2·02	
,, 85	105,112	1·72	
,, 84	89,614	1·46	
,, 83	69,172	1·14	
	1,106,461		18.07%
3rd Grade, 82	48,583	0·79	
,, 81	27,148	0·44	
,, 80	20,303	0·33	
,, 79	10,665	0·17	
,, 78	7,760	0·13	
,, 77	7,255	0·13	
,, 76	6,587	0·10	
,, 75	2,431	0·04	
	130,732		2.13%
Pastry	12,054	Average Grade, 91·61	0.19%
	6,123,440		100%

Dairymen and butter factory managers do not make bad butter from preference. It often happens through circumstances that cannot be

controlled. To make a hard-and-fast rule, and to adhere to it, would be disastrous in many ways. Dairymen beginning on a small scale, and all those living long distances from factories, or where the roads are bad, would be severely handicapped. Most of them would have no chance of making a beginning, and developing their operations to dimensions which would warrant their taking greater care, and making more frequent deliveries of their cream to butter factories. Even in established dairying centres less butter would be produced than has been the case.

The same conditions do not exist all over a small State like Victoria, and they differ even more widely in the stretch from Cairns down to Hobart, and across to Adelaide.

What is wanted is encouragement and education.

If a uniform standard for quality were fixed at any point, it would destroy any inducement to manufacture a very superior article. This statement is not founded on theory; such a result has actually been encountered in connexion with the price-fixing for the local trade for the last few years.

Many of the butter factory managers openly state that they will not go to the expense of pasteurization so long as they get no more for the superior article than for butter which just complies with the standard for the various prices fixed. Why, they ask, should they produce a butter for the local market worth 94 or 95 points if no more can be procured for it than for 92-point butter? And similar questions regarding the lower grades may also be asked.

From experience gained during and since the war, standardization stands for mediocrity—as far as the local market is concerned, all incentive to excel has been largely destroyed.

With regard to the recent proposal for a national brand, it may be mentioned that every package of butter which has left Australia during the last fourteen seasons was branded, as required by the Commerce Regulations, with the word "AUSTRALIA." This brand has acquired a good-will during the period mentioned. In addition, the war secured to Australia recognition and a reputation of inestimable value throughout the whole civilized world. All good butter is further marked "COMMONWEALTH OF AUSTRALIA—APPROVED FOR EXPORT." A national brand with an acquired reputation is therefore already in existence, and it is difficult to understand what is meant at this stage by the adoption of a national brand—unless the intention is to make a change or have only one brand covering the butter from all manufacturers and States.

Such a step would destroy that healthy rivalry between producers, manufacturers, and States, which is the true life of any industry. Australia has been likened to Denmark, and it is suggested that one brand, and a number to indicate the manufacturer, would be sufficient. Such a proposal might be worthy of some consideration if it were intended to apply to a section only of the Western District of Victoria, with uniform conditions and the same area as Denmark; but if applied to the whole of Victoria, where conditions vary so much, it would be

found impracticable. It is, therefore, so much more out of the question when intended to apply to the whole of Australia.

The so-called standardization and nationalization are only phases of the pooling system. For some time past every inducement has been offered to dairymen in Australia to agree to a continuation of pooling in some form or another. Those who have not a reputation for producing a superior article, nor any ambition to do so, would readily agree to the scheme; whilst, on the other hand, people with individuality and independence will give the proposal a wide berth.

There is another matter to which I would like to refer that perhaps does not come under the heading of "Pooling." That is, the proposal to extend Commonwealth control over the production and manufacture of dairy produce. Officially, the State Department of Agriculture has been so far entirely in the dark, but for some time past it has been a matter of every-day knowledge that the Commonwealth proposes to undertake the control of production and manufacture of dairy products for export. These matters have hitherto been administered by the States, and as has recently been announced by the Minister for Agriculture, all the milk, two-thirds of the butter (average for a number of years past), and four-fifths of the cheese produced are consumed locally. Its production and manufacture are necessarily under State control through the Health, Pure Food, and Dairy Products Acts. The Dairy Produce Act recently passed in Victoria comes into operation on 1st July.

This past season, the proportion of butter produced in the Commonwealth which has been consumed locally amounted to seven-eighths; therefore the quantity available for export and coming under Commonwealth control now represents only one-eighth of the production.

Thus the intention is to duplicate services and the cost for same, the whole of which no doubt will have to be borne by dairymen and no one else. Whatever dairymen in other States do in regard to this proposal, it is expected that all sections of the industry in Victoria will see to it that unnecessary overlapping and duplication at their expense will not take place. It would be infinitely better if the details of inspection under the Commerce Act for export were again intrusted to the States. The States carried out these duties satisfactorily for twelve years. The Commonwealth could confine its efforts to general supervision and administration, and take up much-needed research work. If this were done, it would be better for the industry and the export trade.

The artificial conditions imposed on the dairying industry by the Commonwealth during the last few years are mainly responsible for the decline in production and quality. Obviously, the first step towards bringing about a revival should be the removal of these restrictions, and not an unwarranted duplication of legislative effort.

With the great falling-off in production in Europe through the decimation of dairy herds, a unique opportunity exists for the development of the dairying industry in the Commonwealth, and at no period was it more necessary to give it all the encouragement possible.

SOME FRENCH SWEET WINES.

THE SWEET WINES OF SOUTH-WESTERN FRANCE.

By F. de Castella, Government Viticulturist.

(Continued from page 175.)

The best known wines of south-western France are those of the Department of Gironde, which for quantity alone usually ranks third among the wine-growing departments of France—as regards quality it holds an even higher place, seeing that it yields, in addition to many more ordinary wines, the clarets of Medoc and St. Emilion and the white wines of Sauternes and Graves. The sweet wines of Sauternes (dealt with elsewhere) are considered, at least in France, to be the choicest of all fruity white wines.

The neighbouring departments also grow wine in respectable quantity—most of them, in fact, produce many times as much as the total wine yield of the Commonwealth. The great bulk is of the usual light dry type, mainly vin ordinaire with a certain proportion of choicer wines, but here and there localities are to be found, the name of which has since time immemorial been synonymous with something quite distinct. These special wines, though little known outside of France, are often most interesting, several of them are distinctly sweet, a few are intensely so, though they usually present a relatively low alcohol strength. Not the least interesting of these are the partially-fermented wines known as *Macadam* or *Bernache*, which constitute a type absolutely unknown in English-speaking countries, and which, incidentally, give a rude blow to many would-be critics of Australian wine, who are so prone to impugn the wholesomeness of our wines on the grounds of insufficient age. How often do we hear it stated by self-constituted mentors that the great fault of Australian wine is insufficient maturation—that young wine is rank poison, &c.? Age in wine does not necessarily constitute wholesomeness, nor is absence of age injurious. Age undoubtedly renders certain wines more palatable, but others again do not benefit by lengthy keeping. A high-grade claret is undrinkable under four or five years' storage in wood, and continues to improve for many years in bottle. Burgundies mature much more rapidly, whilst vin ordinaire, the every-day beverage of France, is drinkable at a few months old; it is at its best at twelve months, after which it shows little or no further improvement; and yet this is probably the most wholesome wine the world produces!

Macadam wines, as will be seen below, are consumed even before the completion of fermentation, and yet such extreme newness has no injurious effect on the health of the consumer; on the contrary, it is held in many quarters that the yeast cells still in suspension in the new wine have a positive medicinal value.

The present review of the sweet wines of France would be incomplete without a description of the leading types grown in South-western France, which are in the order of their importance:—

1. The sweet wines of Dordogne Department—Monbazillac, &c.
2. Those of Tarn Department—Gaillac, Albi, &c.
3. Those grown in the Department of Basses, Pyrénées, such as Jurançon (near Pau).

The Sweet Wines of Dordogne.

(For the following very interesting description of the wines of this region I am indebted to Mr. M. d'Arblay Burney, who for several years resided in this remarkable district, and is therefore well qualified to write at first hand concerning it.)

Monbazillac.

One of the most picturesque vine-growing districts in France is the Valley of the Dordogne. That portion where the river ceases to be the dividing lines between two adjoining Departments, and where the whole valley becomes included in the Department of Dordogne, constitutes the Arrondissment of Bergerac. Though this ancient town is familiar to modern English ears through the play of Cyrano de Bergerac, the whole Province of Guienne was for a very lengthy period an appanage of the Crown of England through inheritance. The antiquarian finds relics of English rule in evidence throughout the south-west of France, while the tourist is struck by the frequency of dogs called "Talbot." This is explained as being the name of the English General, Lord Shrewsbury, who was killed at the battle of Castillon in the Valley of the Dordogne. The defeat of the English army at this battle (1453) led to the complete loss of all French territory to the English.

As far back as 1352 the wine-producing district of Bergerac was described as consisting of the parishes surrouding Monbazillac on the left bank of the Dordogne, and those extending to Ste. Foy and Montravel on the right bank. For several centuries the name of Monbazillac has been given to a sweet white wine of world-wide fame produced in this neighbourhood. Holland has been for many years by far the largest foreign buyer of this wine, which in good years can be classed as one of the sweetest wines made in any part of the world, and, therefore, strictly a liqueur wine for use at dessert only. It is probable that this extreme sweetness was the means of restricting the popularity of this wine, as the demand for moderately sweet types has grown in leaps and bounds. The average yield of all wines, both red and white, from the Bergerac district averages about 6,000,000 gallons. Of this, at least two-thirds is red wine, mainly a big full-bodied claret much sought after by merchants for blending, owing to its great depth of colour and softness on the palate. These wines are, in fact, more akin to Burgundy in type, though not in flavour, as the Pinot grape is not grown, but only the best varieties of the Medoc. In point of quality, the white wines can be divided into four groups—

1. Monbazillac—sweet liqueur wine.
2. Côte Montravel—sweet table wine.
3. Macadam—sweet new wine.
4. Bergerac—dry table wine.

Monbazillac is produced in much the smallest quantity of these groups, owing chiefly to the great care needed in its preparation, as well as to the reduced yields consequent upon the method of production. This is worthy of detailed description, since the methods employed permit the production of a sweet wine of the highest class without the use of added spirit or any adulteration. As far back as 1774 the keeping of bees was expressly forbidden in districts producing sweet

wines, so that honey might not be used as an adulterant. Monbazillac is conspicuous among the white wines of the south-west of France for the complete absence of any taste of sulphur, which too frequently spoils, to many palates, the most famous Sauternes and Graves. The varieties of grape grown are white Sauvignon, Semillon, and Muscadelle. This latter variety has, so far, not been introduced to Australia, and must not be confused with Muscadet.

Muscadelle, or Muscade, is a thin-skinned white grape with a slight Muscat flavour of the same type as Chasselas Musquê and Muscat de Jesus. The flavour is totally different from that of Brown Muscat or Gordo, and has been likened to the perfume of orange flowers. Although we here find the same three varieties which are characteristic of the Sauternes vineyards, Sauvignon is planted in the proportion of about one-fifth to two-fifths of each of the other varieties. The soil is red clay in which is found flint and limestone.

Vintage takes place very late, by which time most advanced maturity has been attained. At least two or three pickings are the rule, so that only grapes which have reached absolute maturity are gathered. The necessity for going over the vineyard several times is caused by the vagaries of the climate. A hot summer followed by a dry vintage season invariably means fine-quality wines. In the Valley of the Dordogne very heavy dews are usual in the vintage season, such as we seldom see in Australian vineyards. These affect the appearances of the grapes and permit a fungus growth, called noble rot, upon the bunches, distintegrating the skin, allowing water of the berry to evaporate, and so concentrating the must. The sugar-strength is phenomenally high, and 20° Beaumé is said to be commonly attained. In fact, local writers often quote even a higher figure than this in favorable seasons, and they claim Monbazillac to be the sweetest natural wine in the world, a claim which finds justification, as the sweetness is certainly excessive, although it does not reach the almost treacly or semi-solid type of sweetness met with in some Australian wines. The difference is probably due to a different proportion of acids, in which Australian sweet wines are sometimes deficient, causing them to appear sweeter than they really are. The natural spirit-strength of Monbazillac is between 26 and 27 per cent. of proof spirit as a general rule, though higher figures have been found—the sugar-strength of the wine would thus be very high indeed in favorable years—between 4° and 8° Beaumé.

Shallow, wooden, basket-shaped boxes are used for picking, so that all falling berries drop into them and are not lost, as they frequently are in Australia. These boxes are emptied into light wooden tubs, which are carried on a man's neck and shoulders, by means of a straw and wooden frame, to the end of the row, where they are tipped into the larger tubs on the drays.

Grapes gathered at such a state of advanced maturity require no crushing, and are taken direct to the press. The juice is run into wooden vats of about 400 to 500 gallons' capacity; the last pressings are kept separate, and produce second-quality wines. It is allowed to sediment in the vats until the thick crust which forms on the surface begins to crack. This process, termed *levage* (rising), is peculiar to the district, and is followed with the utmost care. The wine is constantly watched by a skilled cellarman, who calls assistance at any hour

of the night or day to draw off the must at the exact stage chosen, and to run it into freshly-sulphured hogsheads. At this stage it is almost brilliant. The crust and lees are most scrupulously separated from the clear must, and are bagged and filtered, and added to the last pressings. The principle of this process is yeast starvation, which permits the retention of a maximum amount of sugar in the wine until the time when the cold of winter completely checks fermentation. No very violent fermentation ever takes place. Should it do so by chance, the wine is forthwith counted as spoiled, and not of fine quality. This slow fermentation at a very low temperature continues for several weeks. The ancient method was to then fill up the hogsheads to the bung and wait until the wine cleared before racking. Modern methods interpose a preliminary racking into well-sulphured clean casks the moment that the first fermentation ceases. The wine becomes bright during the winter, and is at once racked. It is again racked before the temperature rises in the spring. The peculiarity of these wines is that for the first two or even three years they ferment a little in the spring. By the fourth year this tendency must have totally disappeared, and bottling eventually takes place during the winter of the fourth year. Although Monbazillac improves rapidly in bottle, and can be consumed when five years old, yet it also stands a great age. Wines over 60 years old were not uncommon before the war, though these were said to have been recorked several times. Common local tradition is to the effect that Monbazillac destroys corks very rapidly. From the above it will be seen that the method of production is very costly and conducive to very small yields, while the method of manufacture has obvious difficulties. In the first place, temperature plays a most important part, as it may dry up the berries into raisins. Invariably have the wines turned out superlative when this has occurred. In wet seasons the result is deplorable, and the writer has witnessed the misery of persistent rain ruining a fine crop almost on the point of maturity. High temperatures in the cellar are almost unknown, for the reason that the vintage season is so much more retarded than it is with us in Australia. When they do occur, the wines ferment more rapidly, and do not retain the same delicacy as when fermented at a normally low temperature. It is quite questionable whether it would be possible to produce the highest quality wines of this type if fermented at the temperatures common in Australia.

Monbazillac is certainly among the most perfumed wines with the most pronounced bouquet in the world. With the single exception of sherry all such are fermented at a very low temperature. It would appear as though this low temperature of fermentation were essential for the production of this fine development of bouquet. On the other hand, the frequent failure, either partial or complete, to reach even a moderate standard of quality is such as to render vinegrowing in the climate of the south-west of France a doubtful commercial undertaking. Not more than one vintage in every seven can be classed as really high quality, while partial or complete failure can be expected almost every other year. The more exceptional the quality of the wine, the more infrequently it is produced. In a drier climate quite the same standard might not be reached, but a very high-class commercial standard would be the rule rather than the exception. North of the Dividing Range in Victoria there are many thousands of square miles climatically better

suited to the culture of the vine than some of the richest agricultural districts of Europe, from the commercial point of view.

Montravel.

The white wines of Montravel are produced under identical conditions to those described for Monbazillac. The chief difference lies in the sugar-strength not being so high, the resulting wines are less sweet, and can be consumed as are Sauternes and Barsac. The bouquet is somewhat similar to that of Monbazillac, and is entirely distinct from that of any other part of France. There is the same similarity in type between Monbazillac and Montravel as between Sauterne and Barsac. Occasional seasons produce musts up to 16° Beaumé, but rather under this figure would be the average of good seasons. The sugar-strength of wines, even of good vintages, is extremely variable through the variations in the secondary fermentation. Not only do these vary considerably between adjacent vineyards, but also between different pickings at the same vineyard. This variation has militated against the establishment of vineyard brands, and has led to merchants buying new wine and selling it when matured under their own brands.

Macadam.

The origin of this word appears to be connected with the famous roadmaker; it is applied to wines sold on the boulevards of large cities and consumed solely by the working classes. Macadam is a new sweet wine only partially fermented, of low alcoholic strength, and not at all brilliant. Thousands of hogsheads are sent from Bergerac and Ste. Foy to Paris every season. The fashion is purely seasonal, and lasts from the commencement of vintage for about two months. Each cask is carried bung up, with a hole bored in the bung, to let the gas escape, in which are fixed ears of wheat or barley,which prevent any dirt from getting in. The casks are distributed from the railway terminus to the retailer, who taps them and sells this milky and fermenting wine by the glass, in manufacturing and industrial centres chiefly. Workmen take a glass of this either on their way to work, with a crust of bread, or else at their dinner hour, and before their midday meal. The custom of drinking this new wine appears to have originated from a belief in the medicinal value of the yeast in the fermenting wine; it only began to be fashionable about 50 to 60 years ago in Paris and in manufacturing districts. Centuries before this, local custom gave considerable prominence to the consumption of new white wine with roasted chestnuts when sitting round the fire at night.

Chestnuts enter largely into the dietary of the peasantry, and are used much as we would use sweet potatoes. In the forest of the Perigord, cakes made from chestnut meal are used to take the place of bread, but the great sweetness does not attract the uniniated any more than does the sweetness of Macadam. The theory put forward by the writer for this craving for sweet wine at the first touch of autumn cold is that the ordinary dietary—particularly that of the summer—contains so much acid in both food and drink that there is a natural reaction. Whether this is correct or not, the fact remains that the demand was very large for this sweet wine at from 1s. 3d. to 1s. 9d. per gallon straight from the press almost, which was, before

the war, considerably in excess of the price paid for dry wines in the same localities.

Bergerac.

Sold under the names of Bergerac and Ste. Foy are a long list of dry white wines of much distinction and containing a generally lower percentage of acidity than is usual in France. These are produced chiefly on alluvial soil, in distinction to the sweet wines, which are produced on clay and limestone. As in all river valleys there are great variations of soil, all of which affect the quality of the wine produced from them. A relatively small area of rich river flats, which yield quantity rather than quality, have been planted in vines in the Valley of the Dordogne, owing to the great results obtained from tobacco and maize and forage crops without any waiting for returns, as in the case of the vine. The plain land between Castillon and Bergerac is one of the greatest examples of intense culture in Europe. The vine is grown chiefly where such cultures are not possible, on hill sides and on soils difficult to work.

White Wines from Red Grapes.

Although this article is intended to describe better-known types of white wines, yet it would not be complete without reference to a very large production of sweet white wines made from red grapes, which were shipped to the sparkling-wine districts for conversion into champagne and other similar wines.

Before the delimitation of wine-producing districts in France, many firms producing sparkling wines imported from Bergerac and Ste. Foy as much as, or more than, they produced from their own vineyards. These relatively heavy wines were blended with the acid productions of badly-ripened grapes from the colder northerly vineyards, and formed a very considerable part of the export trade in French sparkling wines. They could never hope to imitate, or to replace, the famous growths of Epernay, Ay, or Reims; but, since their introduction into certain localities has been stopped, prices of wine from delimited areas have soared to unheard-of heights without any compensating increase in quality. It can only be a matter of time before the production of sparkling wines will be established upon a large scale in the Valley of the Dordogne, as the wines are naturally adapted for fermentation in bottle.

General Conclusions.

It will have no doubt occurred to the reader that the above notes refer to a district of abnormal agricultural richness. In a climate in which tobacco and maize grow to perfection without irrigation, it is obvious that there must be an excess of moisture for the vine. The average rainfall is over 40 inches, which is less than that of the Médoc, and in consequence the vine will thrive on extremely poor and shallow soils. Every possible inch of ground is cultivated, and the vine yields by far the most important crop, although the persistent fight against fungus diseases makes the cost of cultivation remarkably high. There are never less than three sprayings with copper mixtures for mildew, while five to seven annual treatments are quite common. The same is the case with sulphuring against oidium. At present prices of

chemicals, and at present rates of labour, these annual fungicide treatments become a first charge so heavy as to jeopardize the commercial prosperity of vine-growing, even at the astonishingly high rates for wine now ruling. Many growers claim that they have the greatest difficulty in showing a credit balance in normal seasons. It is of interest to note that, for the 100 years ending 1914, one writer apportions the quality of the production of wines in the south-west of France, as follows:—

	White Wines.	Red Wines.
Very good	15 seasons ..	18 seasons.
Good	17 seasons ..	21 seasons.
Fair	16 seasons ..	11 seasons.
Ordinary and poor ..	37 seasons ..	26 seasons.
Bad	15 seasons ..	24 seasons.

It would not always be possible to make an estimate for a large district with any accuracy.

Looking upon the above figures as a general estimate of quality, the percentage of poor and bad-quality seasons is most striking. From the point of view of quantity, the yield per acre is in excess of the Australian average. It would need to be several times greater than our average in order to compare commercially with Australia, and yet the average yield of the Gironde is under 250 gallons per acre. The 1919 vintage—the largest for many years—is estimated at 326 gallons per acre.

It is by making comparisons with the wealthiest districts of Europe that the unexploited potential wealth of Australia is made so apparent. From the point of view of climate, Australia possesses thousands of square miles of country more suited by nature for the culture of the vine than the most famous and historic wine-producing centres of the Old World.

GUM TREES IN SOUTH AFRICA.

In forestry many valuable results have been obtained in almost every part of the Empire. Take, for instance, the black wattle (*Acacia decurrens*, var. *mollis*) industry in Natal. Here is a case of a tree considered a forest weed in Australian eucalyptus forests, yet in the suitable climatic conditions obtaining in that province has been a great source of wealth, not only from the tannin produced by the bark, but also from the timber so extensively used as mine props, poles, building material, fuel, and boxes for various purposes.

The common European white poplar (*Populus alba*), widely distributed over the farms of the Cape Province, came into its own during the great war, and has been almost the sole source of supply for splints in the manufacture of matches. Were it not for the abundance of this timber, it is probable that the homely match would have been a luxury only the wealthy could afford. Besides being useful for matches, the timber is extensively used for fruit boxes.

Extract from an article "Why Grow Trees?" in the Rhodesia *Agricultural Journal* for April, 1920.

TOP-DRESSING PASTURE LANDS.

Good Results in the Portland District.

(By J. S. McFadzean, Senior Dairy Supervisor.)

When once a dairy-farmer comes to recognise that good pasture grass is the best and cheapest crop he can grow, he is on the right way to make his farm profitable. Excepting possibly lucerne, all fodder crops call for regular annual cultivation and seeding, as well as harvesting. If properly cared for, a good grass crop is possible every year from only one cultivation and seeding in several years, while the bulk of the harvesting will be done by the stock with little or no waste, but land sown to grass should have an annual dressing of some fertilizer if a full crop is to be raised.

Most farmers will endeavour to get good yields from fodder crops by following a definite system of fertilizing, but very few indeed ever realize that their grass land is quite as much in need of fertilizing as land under cultivation. That there are some exemptions to this rule has occasionally been shown by instances recorded in this journal, and they certainly demonstrate the opportunities awaiting so many farmers if they would but give attention to this side of their fodder supply.

At Allestree, 6 miles out of Portland to the east, is the farm of Mr. W. Cook, containing 266 acres, subdivided into twelve paddocks. Some fifteen year ago all but about 15 acres of this land was in a very rough unimproved condition, but it has gradually been cleared of timber and undergrowth until now about 200 acres are growing good grass, and last year the dairying returns averaged £17 per head from butter fat for the whole herd of twenty-four cows.

The striking feature of the land in this locality is the abundance of strawberry clover. On Mr. Cook's farm it was first noticed about eight years ago after an experimental top-dressing of superphosphate had been given some grass land. Soon afterwards strawberry clover began to make good growth, showing strongly through the rougher grasses which had previously covered the ground. As this top-dressing gave such good results it was extended each year until now a fair proportion of the grazing land of the farm has been treated, and its carrying capacity is greatly increased.

From the way the strawberry clover developed here, consequent on the land being top-dressed, it is evident that it must have been established for very many years, but had been unable to show out from amongst the coarser native grasses until stimulated by the superphosphate dressing. After the application of the fertilizer the clover came on strongly, and is growing thicker each year.

No one appears to know anything of the introduction of strawberry clover into this district, but it is so very widely spread that its coming must date back to the early settlement, having been introduced by the pioneers of, possibly, the early "forties." Once started the plant would spread over a wide area through the seed being carried by stock and flood waters, to ultimately show itself in its luxurious abundance when clearing and cultivation had given the required conditions. An instance of the tenacity of this plant was some time since

mentioned in connexion with the Sparrowvale farm at Geelong, where it has established itself so firmly that it displaced a strong growth of lucerne on the grazing areas, yet the carrying capacity of the land was not reduced in consequence.

Mr. J. Cook's Cows.
First and Second in Butter-fat Test at Portland Show, February, 1920.

Mr. Cook has been very successful in the dairy cow class at Portland shows. In 1919 his cow "Mottle" was placed first with a yield of 2.42 lbs. of butter fat for the day; another of his herd, "Jean," being fourth; while this year "Jean" was first with a yield of 2.26 lbs. of butter fat for the two milkings. The dam of the bull now in use in the herd was the winner at both the 1917 and 1918 shows, and has a record of 2.49 lbs. of fat for the day.

Some 2 miles nearer Portland and close to the Portland Bay beach road is another well-managed farm which is owned and worked by Messrs. E. and A. E. Taylor. The farm has an historic interest, being part of the 2,000 acres selected by Mr. Edward Henty, the pioneer of the Western District, shortly after landing at Portland from Tasmania; and the late Mr. William Taylor—father of Messrs. E. and A. E. Taylor—was overseer of Mr. Henty's property for twenty years. When Mr. Henty decided to sell this property he gave Mr. Wm. Taylor the first choice of any portion of it, and the 240 acres then chosen has been the property of the family ever since.

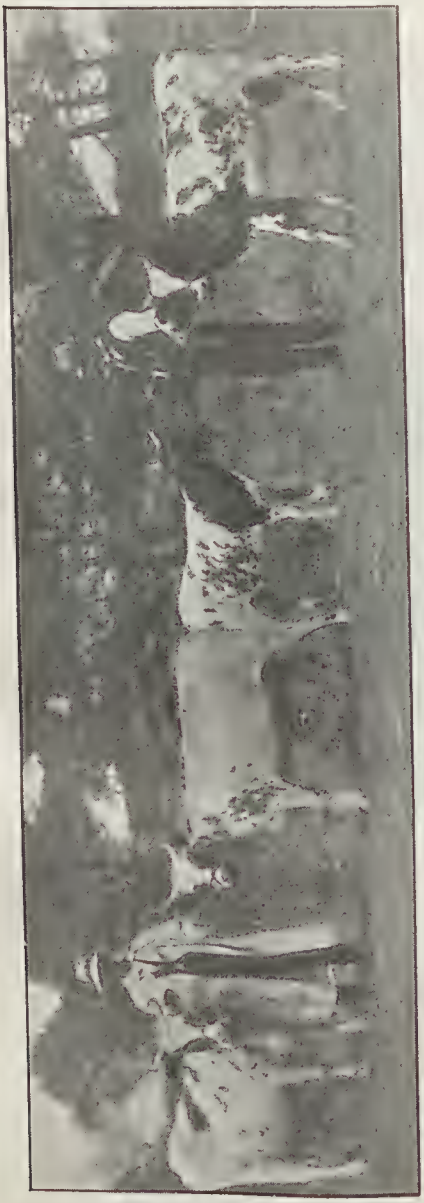
A good supply of water seems to be obtainable throughout this district. At Mr. Cook's it was struck at a depth of 16 feet from the surface. On the farm of the Messrs. Taylor there is evidence of a splendid underground water supply, and in one of the paddocks a spring opened at the direction of Mr. Henty sixty-five years ago has

not since been dry. Most of the farm is on a strip of land about ½ mile across, which lies between the hills and the beach. In its natural state it was covered with eucalyptus and tea-tree, but having been cleared and broken up is now carrying a good sole of rye grass and clovers. Portions of these flats are of a black sandy loam, and lying somewhat higher than the rest, the grass comes away there earlier than on the lower portion, but on this latter it comes on well later in the spring; and, lasting longer, gives a good and continuous summer growth. The property is subdivided into nine paddocks, and 14 acres of the grass land was top-dressed with fertilizer during the past year. Each year on some portion of the flats the rye grass and clover is cut for hay and stored for winter use.

Heifers on the Farm of Messrs. E. and A. E. Taylor, Allestree, Portland.

A portion of the crop from the 20 acres cultivated further assists in the maintenance of the milk supply from the twenty-three head of dairy cows, and they consequently give a long milking season, invariably holding well on towards their next calving. Five years back the herd was tested over several months to ascertain the individual production of the cows, and as the result some 20 per cent. were culled out, leaving the herd showing an average test of 4.8 of butter fat. Subsequently a bull of the Gowrie Park strain was purchased, which herd is one of the highest yielding and best testing lines of Ayrshires in the State. Now Messrs. Taylor Brothers have also a Jersey bull from the St. Albans stud at Geelong, whose dam gave 943 gallons of milk and 523 lbs. of butter fat on the official 273 days' test.

At the last Portland show Messrs. Taylor Brothers exhibited ten head of cattle, and secured eight prizes, including that for the champion bull of the show.



Messrs. E. and A. E. Taylor's Ayrshires.
Winners at the Portland Show, February, 1920.

Most of the heifer calves are raised, and all surplus skim milk is well utilized in feeding the progeny of three brood sows. These three are a Berkshire and Yorkshire cross, and are particularly good mothers, having reared among them thirty-three out of thirty-five pigs in their last litters. The barley for topping off the pigs is also grown on the farm.

The dwelling at this homestead — weatherboard, with attic rooms—is said to have been built and used by the Henty family when they first landed there, yet it is still neat and trim, and in very good repair, but in all probability the quaint old stone and mortar structure shown on page 412 is of earlier construction than the dwelling at present in use. From its rough but substantial architecture, as well as the age of some of the trees in the yard behind, there is every probaility that this old place now used only by rabbit-trappers or other casual bushworkers outdates all other relics of the early settlement.

Another instance of top-dressing grass land in this district is seen on the small farm of Mr. E. G. Thomas, of North Portland. During 1919 thirteen cows were milked here on 35 acres, and returned nearly £15 per head for butter fat alone, two of the herd being two-year-old heifers and two three years old. Beginning eight years ago all the land on this small farm was broken up and cropped at the rate of about 6 acres per year. Crops of potatoes and of oats were taken off each 6-acre lot before it was left for grass, and subsequently each lot was

top-dressed annually with 1 cwt. of super and bone mixture. This year the place is carrying sixteen head of milkers, and they are in good order and doing satisfactory work.

Instances such as these show that while hundreds of farmers throughout the State are neglecting to give attention to their grass

First Homestead on Land Selected by Mr. E. Henty.

land, others are finding it very profitable work. And not only in increased grazing is there very definite return from top-dressing, but experience has shown that stock running on well-cared for pasture land is better in health, sounder of constitution, and altogether thrive better than those on worn-out land. Well-grown pasture is the best of nourishing food for dairy stock, and every farmer and grazier should give full attention to the annual grass crop. Certainly no other cropping will give him more profitable return for his work.

TOMATO DISEASES.

By C. C. Brittlebank, Vegetable Pathologist.

"Bacterial Wilt."

Bacillus solanacearum, E. F. Smith.

This is the cause of the well-known potato disease "Sore Eye" or "Wet Rot." In the tomato, as well as in the potato, there is a sudden wilting of the plants, the result partly of the water supply being cut off by the blocking of the water-bearing vessels by the bacteria and their products.

All wilted plants should be removed and burned as soon as observed. Land on which this disease has occurred should not be used for tomatoes, potato, capsicum, or tobacco crops for an interval of two or three years. The disease can be carried from diseased to healthy plants by gnawing insects. For the control of insects, spray with 2 lbs. of arsenate of lead in 50 gallons of water. Fortunately, "Bacterial Wilt" is not, so far, common in the tomato fields of this State.

Irish Potato Blight.

Phytophthora infestans, De Bry.

In the drier portions of Victoria, Potato Blight has not caused any considerable loss to tomato-growers. Besides the potato and tomato, a native solanum, *Solanum aviculare*, has contracted the disease.

Weather conditions are the predominant factors in the spread of this disease. Heavy continued rains in January, February, and March with cloudy muggy weather are favorable to the development of potato blight in the tomato. As a rule, the fruit is more commonly attacked than the leaves.

On the leaves, dark-brown or black blotches appear, generally at the tips or sides. On the undersurface of these diseased areas a fine greyish-white mould will be noticeable if the weather be warm and moist. This mould is composed of upright branching filaments, on the free tips of which are borne numerous lemon-shaped sporangia.

Dark streaks will show on the stems and leaf stalks—these, as well as those on the leaf, extend until the whole plant is black and dead. On the fruit, slightly-sunken irregular areas appear—brownish-red in colour—and of a varying size. If the fruit be cut through, the flesh will be found to be brownish and mottled, and somewhat firmer than the healthy fruit. Spraying with 8, 10, 40 copper-soda should not be delayed if the disease is observed, and it is better to anticipate it and spray to prevent rather than to wait until the disease is present.

Climatic conditions favorable to the development of Potato Blight also favour the development of other diseases which attack tomatoes. Spraying should be carried out whenever weather conditions permit.

Wilt, "Sleepy Disease."

Fusarium lycopersici, Sacc.

The sleepy disease is caused by a parasitic fungus, *F. lycopersici,* Sacc., which gains entrance into the plant through the roots. Plants are liable to attack by this fungus at all stages of growth from the time they are seedlings until they are in full fruit. Young plants when attacked fail to keep pace with the healthy ones in growth; their leaves assume a sickly yellow, and the lower ones fall. Other plants show the effects of the disease when the first cluster of fruit is about to ripen, and it is seldom that any plants attain a greater development, the last symptom being a sudden wilting, and death quickly follows. When the fungus has gained entrance into the tissue of the plant it cannot be controlled, and plants should be destroyed as soon as it is seen they are contaminated.

In some tomato-growing countries the sleepy disease or wilt has caused very serious losses, and it is common to have every plant in large blocks killed off just as they are coming into bearing. Fortunately, however, neither the Bacterial nor the Fusarium Wilt has yet caused any marked loss in those districts of our State most suited to tomato culture. Every care should be taken, therefore, to check the first outbreak. When once the Fusarium has invaded the soil, it is most difficult to eradicate, soil treatment being too expensive. The only means of clearing large areas is by rotation of crops; and, as the fungus is known to remain in the earth for seven years, it would be a great loss to growers for tomato land to lie idle for this long period.

Target Spot.

Alternaria solani (E.M.) Jones, et. Gront.

This disease is one of importance to the tomato grower. Plants may be attacked at any stage of growth, from the seedling to the plant in full bearing.

Symptoms of attack are—On the leaves well-defined and more or less circular spots develop; these rapidly increase in size until in cases of virulent attack they become confluent.

If the spots be carefully examined they will be found to be marked by concentric rings, hence the common name "Target Spot." These rings indicate the stages of growth made by the fungus within the tissue of the leaf.

On the stem and leaf stalks black or brownish-black streaks and spots show. Later, the whole plant assumes a sickly yellow colour, with the leaves blotched yellow and folded inwards.

Fruit affected by "Target Spot" develops sunken or depressed spots and blotches beneath the skin. In time a dark mould appears on the diseased spots, and the fruit rapidly decays.

Control—Cultivate and stimulate the growing plants, for usually the disease is in part due to their want of vigour. Spray with 6.9.50 copper soda as soon as the disease appears. A second spraying must follow within seven days, and a third later, if necessary.

Good results have been obtained by the above-mentioned method of control. At one place several thousand bearing plants, under glass, were badly attacked. They, as well as the glass, benches, and floor of the house were sprayed as directed, with the results that the disease was completely controlled, and did not appear in the tomatoes grown in the house during the same or following year.

Spotting of the leaves and stem is a feature of this disease, as well as in the one known as "Spotted Wilt"; therefore, care should be taken in examining the leaves to ascertain if the spots show the concentric rings. Spots caused by the "Target Spot" are much more definite than those caused by the "Spotted Wilt." Spraying with copper soda has no effect on "Spotted Wilt."

SEEDLING DISEASES.

There is no period in the life-cycle of the tomato more critical than that of the seedling stage. The treatment given in the initial stages of the life of a plant or animal has a marked influence on its ultimate success. This is more noticeable in short-lived plants than in those which attain a great age. Consequently, better yields may be looked for from vigorous tomato plants than from those which have been checked by disease while seedlings.

It should be the aim of the grower to raise clean plants; to this end he must use every care to see that the soil of the seed bed is freed from fungi liable to attack seedlings. This can in a great measure, be attained by sterilization of the soil by steam, or by using virgin soil to which an admixture of lime has been added. Steps should be taken to exclude diseased material from previous crops gaining entrance to this soil. Many growers foolishly use the same earth in the seed beds year after year, and when new beds are required old dead tomato plants are collected and mixed up with the soil. Such practices will bring about conditions under which it will be impossible to produce healthy plants. In those districts where the extensive and intense culture of the tomato is practised, diseases will be more common and more difficult to control than in the past. This is due to the fact that there are many more centres of infection from which the disease can spread to the adjacent blocks.

Root Rot.

Rhizoctonia solani, Keuhn.

One of the most destructive seed-bed troubles is caused by the fungus known as *Rhizoctonia solani*, Keuhn. This is essentially a soil-inhabiting fungus; therefore, earth containing it, if used for seed beds, will produce diseased seedlings if the temperature and the water-content of the soil be high.

Unfortunately, quantities of the soil used in the suburban districts for seed beds is naturally infected, and consequently many of the young plants when sold fail to thrive, or remain stunted and produce a light worthless crop.

Seedlings in their early stages when affected by Rhizoctonia have the edges of the leaves folded upward and inward, their tips purple or bluish-purple. Later, the plants rot at slightly below the soil

surface and topple over. This severe form of attack may affect a few plants scattered through the seed bed, or it may spread outward from the center of infection, killing all the plants in the bed. In milder attacks, the plants remain stunted, with the lower leaves yellow, the upper folded inwards, and the crown leaves crowded and slightly rigid and of a greenish purple.

If the roots of one of these plants be carefully examined, very fine dark-brown threads will be observed; they will also be noticeable on the underground stem and at the collar of the plant.

Microscopic examination of the roots in section will show that the fungus has invaded the cells, causing injury and death to the invaded roots, but not to such an extent as to kill the plant. Experiments carried out with a like number of diseased and healthy plants gave the following results:—The yield from the diseased plants was seventeen and a half times less than that taken from healthy bushes. Thousands of slightly diseased plants are sold annually round the suburbs of Melbourne, and this may account for the many failures to obtain a good return.

Control measures are of little or no avail where plants have their roots invaded by Rhizoctonia. Soil sterilization by steam should be carried out if possible. If this cannot be done, lime should be mixed with the soil at the rate of 1 cwt. to 5 cubic yards. The mixing should be done about six months before the soil is to be used. After mixing the lime, the soil should be turned over at least twice before it is brought into use. Water should be used as sparingly as possible, and the temperature kept between 68 to 72 deg. Fahr. The control measures suggested have been followed by several of the largest growers of tomato plants with perfect success. "Root Rot" in former years destroyed many thousands of seedlings, but at the present time no loss occurs in the houses where the above directions are carried out.

Damping Off Disease.

Pythium de baryanum, Hesse.

"Damping Off" is another disease which attacks young tomato and other plants.

Symptoms: The plants appear sickly, soon decay at the collar, and fall over and perish. The roots, as a rule, are not injured, the point of attack being just at or below the soil surface. Whole trays are killed off within a few days. As the fungus remains in the soil for some considerable time, the trays and soil should on no account be used again until they have been sterilized.

When this disease appears among seedlings, it can be taken as a sign that too much water and too little ventilation have been given, and that the temperature has been kept too high.

"Damping Off" is often difficult to control, but favorable results have been obtained by a heavy drenching of the plants and soil with 6 lbs. of bluestone and 9 lbs. of washing soda in 100 gallons of water, or by dusting the plants with sulphur. This treatment, together with careful watering and good ventilation, should hold this disease in check.

SMALL FRUIT CULTURE IN VICTORIA.

By A. A. Hammond, Orchard Supervisor.

THE LOGANBERRY—*continued.*

Training Methods.

There are several systems of training the loganberry. The system now generally adopted in commercial plantations is that of training the canes on a wire trellis. One, two, and sometimes three wires are

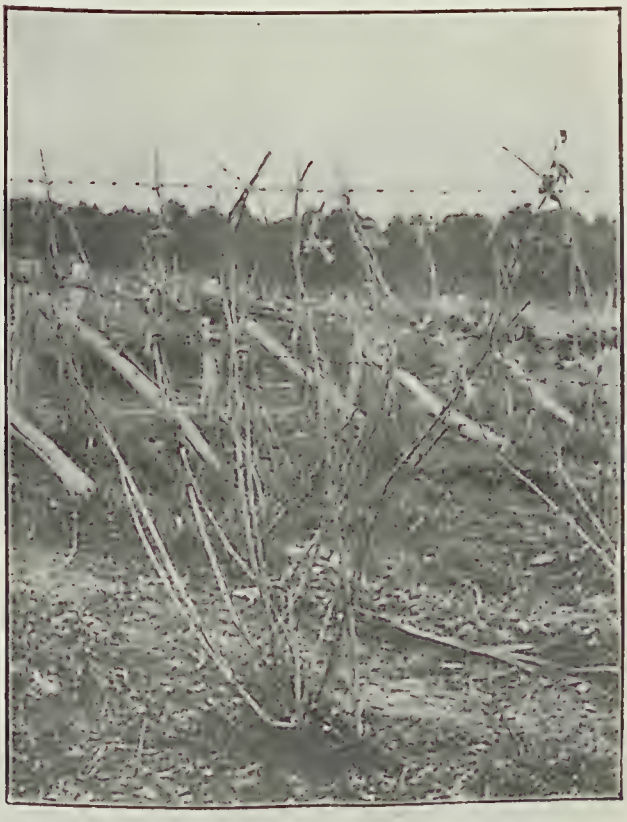


Fig. 5.—Loganberry Trained on the Fan System. (The height of the trellis is 5 feet, and two or three wires are used.)

used, but the cheapest and most satisfactory trellis for commercial plantations is the one wire trellis. The advocates of two or three wire trellis claim that by the training of the vines on two or more wires the canes are enabled to be spread out, and this results in increased fruitfulness, whereas with the one wire system the canes, being crowded, many fruit laterals are suppressed. It is found, however, in practice

that any slight advantage gained in this way is more than counterbalanced by the extra cost of the trellis, the increased cost of putting up the canes and in the harvesting of the berries.

Mr. W. C. Murfet, of Ringwood, who has the largest plantation of loganberries in Victoria, states that an acre of plants can be put up on the rope system by one man in a week, while it takes four weeks to put up an acre on the fan system. The rope system of training may be practised on two or three wires, as is sometimes done, particularly in the case of very vigorous plants, or a combination of the fan and rope system or the weaving system. In private gardens or small plantations, where labour is not an important factor, the more elaborate methods could doubtless be practised with advantage, but when grown commercially on a fairly large scale the cheaper and simpler system is advocated.

Fig. 6.—Loganberries Trained on the Rope System. A single barbed wire 3 feet 6 inches from the ground.

The height recommended for a single wire trellis is from 3 feet to 3 ft. 6 in. Posts about 5 feet long, sunk 2 feet in the ground, are placed 15 feet apart in the rows, the distance between the rows being from 6 to 8 feet. The end posts must be braced as shown in Fig. 5. At times the posts are placed at intervals of from 20 to 30 feet in the rows, but this is not recommended as trellises so constructed are not sufficiently rigid. Galvanized barbed wire is then strained taut and stapled to the top of the posts. The advantage of using barbed wire is that the canes are held firmly in place by the barbs, and are not blown about by the wind when carrying a crop of berries, as is the case when plain wire is used.

The canes may be tied up at any time during the winter. When tip plants are required this cannot be done before the end of June. The canes are taken up in a bundle and wound around the wire in one direction, as shown in Fig. 6, and are cut or broken off and tied before reaching the next plant in the row. This method of training is called the rope system. The fact that some buds are suppressed by the rope

system of training is compensated by the increased vigour and fruitfulness of the remaining buds. Half the canes of a plant may be trained in one direction and half the other, but there is no advantage in doing this, and it takes more time than training in one direction.

To enable cultivation to be carried on during the summer it is necessary to train the growing canes along the ground close to the trellis. The canes are kept in place by clods of earth, a shovelful of soil on a few pegs. The training of the growing canes as described is necessary, not only for the purpose of cultivation, but later, when the berries are being harvested, the canes, if allowed to spread over the space between the rows, would be trampled upon and injured by the pickers.

Fig. 7.—Training Canes on a single barbed wire on the Rope System.

Pruning.

The pruning of the loganberry is very simple. It consists in removing the old canes immediately after fruiting, the shortening back of canes, if required, when wound around the wire so that one plant will not be allowed to encroach on the space of the next and the cutting out of any weakly canes. Lateral growths may be cut back to a few buds or completely removed.

The usual number of canes produced by a plant is about eight. Vigorous plants may produce a dozen or more canes when well established, and weakly ones only four or five.

When cutting out the old canes, which die after fruiting, care should be taken to cut them as close to the crown as possible. The prunings should be collected and burnt immediately after pruning to prevent any diseased old canes from infecting the new ones.

Manuring.

There is no better fertilizer for loganberries than stable manure. In soils that are rich in humus the use of this manure is not so important, but in soils lacking humus, stable or other nitrogenous organic manure is essential. Stable manure is valuable not only because of the plant food which it contains, but also because of the physical improvement which it effects on the soil. The capacity of the soil to hold capillary water is increased. It also allows of better aeration, and increases bacterial activity, which results in the liberation of plant food that would otherwise remain insoluble. Stable manure varies considerably in its composition, but good manure is rich in nitrogen and contains a fair percentage of potash and phosphoric acid.

The quantity of stable manure required per acre is dependent on the nature of the soil. The application of 10 tons per acre may be considered a fair dressing. On poor land 20 tons per acre would not be too much. The manure should be spread over the land between the rows and ploughed in after the canes have been put up. A dressing in spring and a summer mulch greatly assists in the conservation of moisture. This is recommended on land deficient in humus, especially in the drier districts. Green manuring is a good substitute for stable manure. Field peas or tick beans should be planted in autumn before the land gets too cold, and the green crop ploughed under in spring when in bloom. Owing, however, to the comparatively narrow spaces between the rows the proper management of a leguminous crop is difficult.

The cover crop should be manured, and the manure recommended for this purpose is as follows:—

Bone dust or dried blood ..	150 lbs.
Superphosphate	600 lbs.
Sulphate of potash	400 lbs.
	1,150 lbs., or, roughly, 10 cwt.

Which should be used at the rate of 3 cwt. per acre.

As potash is almost unprocurable at the time of writing, bone dust or dried blood, or a mixture of both and superphosphate in the proportion of three of super. to one of bone dust may be used. If applying manure direct to the loganberries a good artificial fertilizer is a combination of two parts by weight of bone fertilizer, one part of superphosphate and one part sulphate of potash. Apply at the rate of 5 cwt. per acre.

Harvesting.

The loganberry begins to ripen about the third or fourth week in November in the southern districts, according to the season, and continues for about six weeks. In picking for the fresh fruit market it is desirable to go over the plants every second day, otherwise there is a danger of the berries becoming over-ripe. When intended for the jam or cordial factory picking twice a week is sufficient, unless the berries have to be sent long distances, in which case a firmer sample is required. The medium ripe berry is of a bright red colour, and the fully ripe a dark red. The medium ripe berries, of course, carry

Fig 8.—A Good Specimen of Tip Plant. This plant was produced from a cane rooted in May, and was lifted on the 6th July following.

much better than the fully ripe ones, and the degree of ripeness when they should be picked depends on the distance from the market and the condition in which they can be landed there.

When intended for jam or a beverage the berries should not be picked until fully ripe. Such berries make better jam, and there is no hard core as with immature fruit. When intended for the manufacture of a beverage, it is essential that the fruit be allowed to ripen on the canes. Fully ripe fruit is more necessary for the manufacture of a beverage than for any other purpose.

In this connexion the following tables published by Messrs. Lewis and Brown, of Oregon Agricultural Experimental Station, United States of America, is of interest:—

TABLE I.

EFFECT OF THE RIPENESS OF LOGANBERRIES ON THE QUALITY OF THEIR JUICE.

Sample.	Ripeness of Berries used.	Percentage of Juice obtained.	Rank according to Quality.
No. 1	Immature ..	59.3	Fourth
No. 2	Medium ripe	71.8	Third
No. 3	Ripe ..	71.8	First
No. 4	Over ripe ..	78.1	Second

TABLE II.

COMPOSITION OF THE JUICE OF THE LOGANBERRY.

Juice obtained from—	Specific Gravity.	Acidity.	Total Sugar.
		per cent.	per cent.
No. 1. Immature berries	1.032	2.06	3.50
No. 2. Medium ripe berries	1.0395	2.10	4.91
No. 3. Fully ripe berries	1.045	1.88	6.40
No. 4. Over ripe berries	1.040	1.78	6.46

It will seen from the above tables that both the sugar content and juice are much greater in the fully-ripe fruit than in immature fruit There is not much difference in the juice content of the medium and the fully-ripe berries, but there is a considerable difference in the sugar content. The number of pickers required, of course, depends on the crop, but about five per acre are usually required to keep pace with the ripening berries. It is best to pick in the cool of the morning, especially when dealing with the fully-ripe berries. In large plantations, however, this is not practicable. In the cool of the morning the berries are firmer and separate more readily from the stem, and thus may be plucked with less danger of crushing.

Each picker should be supplied with a hand carrier. The carrier shown in Fig. 9, which holds eight punnets, is a handy size, and is easily made. Carriers attached to the waist are sometimes used, but the objection to these is that the berries are often spilled when the picker stoops low in picking. Care should be taken to keep the berries in the shade when picked, as they are spoilt if left standing in the sun.

Figure 10 shows a 40-punnet crate, which is used in sending berries to the fresh-fruit market. There are five tiers, each containing eight 1-lb. punnets. A tray or slide which is cleated separates the punnets in each tier, the cleats resting on the rim of the punnets. This arrangement prevents the crushing of the berries. Wooden buckets, such as are used for raspberries, are used when sending berries to the factories.

By Products.

The loganberry can be put to several commercial uses, including the making of a very fine beverage. The following extract from

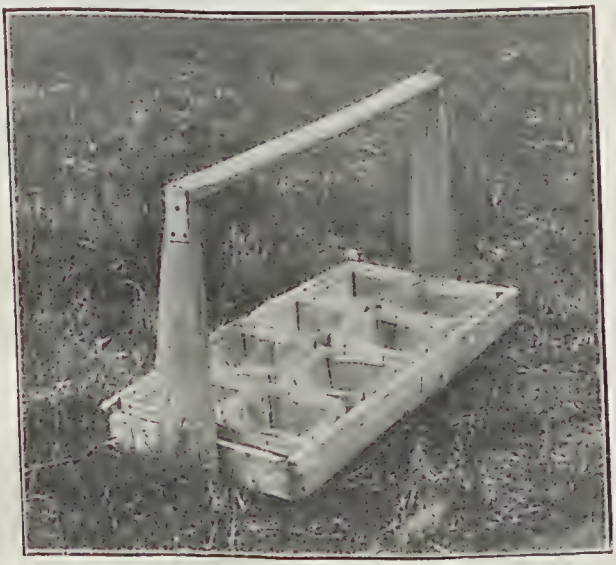


Fig. 9.—Hand Carrier for Loganberry Picker.

Fig. 10.—Forty-punnet Crate for Sending Berries to the Fresh Fruit Market.

circular No. 54, issued by Department of Agriculture, British Columbia, is of interest in this connexion:—

Home-made Loganberry Juice.

Citrus fruits contain citric acid in their juice, which acts as a tonic to the human system. Chemical analysis shows that the acid

content of the loganberry is chiefly in the form of citric acid, and for this reason the juice is very pleasant and healthful. In the home as a beverage there is nothing more palatable. Because the logan has so many favorable qualities the reputation of its juice has now spread over the entire continent.

The juice is now manufactured commercially in large quantities in Oregan, but at present there are no commercial plants in British Columbia. The machinery is very expensive, and the pipes through which the juice passes must be silver lined to prevent the action of the citric acid.

For home use a practical formula is as follow:—

Use berries which were left to become dead ripe on the vines. When perfectly ripe the berries contain more sugar than at any other time, and the juice then has the best flavour and aroma. When dead ripe the berries contain about 78 per cent. juice; when medium ripe only about 70 per cent.

Press the juice after crushing them thoroughly. If a press is not available, they may be put on a stove with 1 inch of water in the bottom of the pan and heated, *but not boiled.* Then place them in a flour-sack and wring the pulp dry. After this the juice is ready to pasteurize by heating to about 200 deg. Fahr. *Caution.*—Do not let the juice boil. While pasteurizing the juice the glass bottles or jars, tops, rubber rings, corks, &c., should be sterilizing in a pan of nearly boiling water. Sterilize the cup or ladle used for dipping out the juice. Do not touch with the hands any of the equipment to be sealed.

When the juice is nearly boiling hold the bottle with a mechanical grip over the pan of juice. Fill to within 1 inch of the top, using sterilized ladle. With a sterilized fork take a rubber ring from the hot water and place it on the jar. With two sterilized forks take a lid from the hot water. Clamp or screw the lid on firmly and the job is finished.

Notice.—The vital points throughout the process centre on thorough sterilization. If properly done, even without sugar, the juice will keep for years.

Regarding the amount of sugar, use no sugar at all if you wish. However, sugar must be added sooner or later, so it is advised that enough sugar be added when making to suit the average taste.

Juice made in this manner is too rich to drink straight. When ready to use, dilute with about three parts of water to one of the juice.

Jams, Jellies, &c.—The logan jammed alone is superfine. When jammed with one part of raspberries or blackberries to three parts of loganberries, a more palatable combination could not be desired. If early apples are available, 20 per cent. apples and 80 per cent. logans make a very good jam or canned combination. Loganberry jelly is the finest made, and has a flavour all its own. Home-dried logans are a luxury during the winter months. Before the advent of prohibition loganberry wine was equal to the finest claret.

Estimated Cost of Planting and Probable Returns from One Acre of Loganberries.

The cost of establishing a 1-acre plantation of loganberries doubtless varies considerably in different localities. The following estimate is based on figures kindly supplied by Mr. W. C. Murfet, of Ringwood:—

	£	s.	d.
Preparation of land for planting	2	0	0
Cost of 1,200 plants at 9s. per 100	5	8	0
Cultivation until first crop is harvested ..	10	0	0
Erection of trellis, labour, and material ..	20	0	0
Training vines and tying up, &c.	2	12	0
Harvesting and marketing crop	57	0	0
	£96	0	0
Estimated value of crop eighteen months after planting, viz., 7,200 lbs. at 5d. per lb. ..	150	0	0
Net return first season	£54	0	0

Rent of land or interest on the capital value as the case may be, has not been included in the cost of production as this differs considerably in various districts. The cost of manuring and irrigation are also items of expenditure that cannot be estimated. The cost of these depends largely on locality and soil.

Briefly, it may be stated that the cost of production, harvesting, and marketing may be estimated at from one-third to two-fifths of the total value of the crop, and this may be reckoned at from £200 to £300 per acre after the first year.

The profitable life of a plantation naturally depends on the care which it receives and the soil on which the plants are grown. It may be stated, however, that the average profitable life is fifteen years.

(To be continued.)

A BERRY BOOM.

The American strawberry-growers are in great glee over the enormous increase in demand and the rising price of berries, due, they believe, to the advent of prohibition. A writer to the *Country Gentleman,* without going so far as to give the whole credit for the boom to the closing of the bars, considers it an important factor.

In 1909, the last year for which census figures are obtainable, the value of the American strawberry crop was set down at £25 per acre: to-day it is anywhere from £100 to £200. "Growers are wiping out mortgages, buying automobiles, or wearing paths between their fields and the savings banks—all because a series of factors have conspired to send strawberry prices up."

FISH MANURE.

P. Rankin Scott, Chemist for Agriculture, and Will C. Robertson, Supervising Anaylst.

For many years past there has been a marked shortage of bonedust and kindred fertilizers in Australasia. In this State the requirements exceed the supply, but it must be admitted that the demand is for a low-priced manure, with the result that agriculturists in adjoining States outbid the Victorian farmer. Consequently the demand which exceeds the supply is the demand of the manure-broker or dealer, accentuated by Inter-State orders.

It is time the slogan, "Wake up, Victoria," was heard by the Victorian farming community. If a fertilizer is worth £10 per ton, plus freight (no insignificant figure) to the West Australian or Tasmanian farmer, it is surely worth the f.o.b. price to the farmer south of the Dividing Range.

It is not suggested that bonedust should be used in the northern areas. Experiments during the past twenty years have conclusively proved that the quick-acting superphosphate is the best artificial fertilizer for wheat, &c., when sown for grain in the wheat areas. On the other hand, bonedust and kindred fertilizers give marked results in the districts of Southern Victoria. Bonedust, when mixed with an equal weight of superphosphate, is particularly suitable in certain areas for the manuring of the hay crop. It gives excellent results in the case of forage and root crops, and is the fertilizer *par excellence* in market garden culture.

Its comparatively slow action and lasting effect, together with its stable composition, render it pre-eminent as a fertilizer in mixed farming operations, especially when the "mixed farm" is owned and worked by the farmer.

Continual and persistent inquiries at the Laboratory as to where bonedust, bone manures, or any material which would act as a substitute can be obtained have directed attention to the fish fertilizer industry. This fertilizer may be regarded as a substitute for bonedust, which at the present time is almost unprocurable, and should produce similar results when applied to land south of the Dividing Range. Any quantity up to 2,000 tons could be placed annually at a figure based on the analysis and the unit values in existence.

Fish manure, or fish fertilizer, is the residue obtained when fish scrap or non-edible condemned or "overflow" fish are "cooked" and pressed for the extraction of fish oil. It is a combined nitrogenous phosphatic manure of moderate availability, and may be used as a substitute for bone and blood or bonedust. When the industry was first established an erroneous impression existed that the fertilizer was practically valueless owing to the fact that the oil it contained acted as a waterproof coating to the bone and flesh particles, thereby preventing decomposition and the subsequent availability of the plant foods, viz., nitrogen and phosphoric acid. This is so in fertilizing materials contaminated with mineral oils, but animal oils are much easier oxidized or decomposed.

Of course, as the primary product in the fish scrap industry is the oil extraction, it necessarily follows that the oil content of the residue, which is subsequently converted into fish fertilizer, is reduced to the minimum. In the manufacture of bonedust the first operation has for its object the recovery of fat (tallow), but the finished article is not by any means free of fat. The same applies to the fish manure. There would not be a great deal of difference in the oil content (ether extract) of the two fertilizers.

Upwards of 100,000 tons of fish fertilizer, the dried cannery waste from fish canning after oil extraction, are annually produced in the United States of America. This product is sold as "fish scrap fertilizer."

In certain instances, the "overflow catch," *i.e.*, the fish caught in excess of the canning factory's capacity, is utilized for the extraction of oil and the manufacture of fish fertilizer. As the raw material—the fish scrap and condemned fish—is obtained for the cost of collection the industry is a highly profitable one. In New South Wales and New Zealand the fish-oil industry has obtained a footing. No data are available regarding these factories, but it is known that the one in New South Wales augments its supply of raw material from the waste of the trawling industry by the purchase of fish at a price per ton from those who care to sell. In New Zealand the factory is practically an adjunct to the canning industry.

For many years a fish oil factory was situated in Southern Tasmania, but with the death of the proprietor the industry was allowed to lapse.

The Industry in Victoria.

In Victoria an attempt is being made to install the industry in Gippsland at Lakes Entrance, where Messrs. Michelson Brothers, local fishermen, have been experimenting in a small (and exceptionally crude) manner on Rigby Island. Lack of capital is the sole reason for their rudimentary plant and its infinitesimal capacity. Oil has been obtained from sharks, stingarees, porpoise, smig, and other fish, but the work has been intermittent.

The simple method of "cooking" in an ordinary copper and subsequently "floating off" the oil in a small galvanized iron tank is followed. An attempt was at one time made to manufacture a fertilizer, but in this endeavour the experimenters made a sad mistake. The solid residue from the "cooker" was thrown aside whilst the "soup" or liquid from the oil tank was run into "slabs" of marl or soft chalk. The slabs were subsequently air-dried, crushed, and, after being mixed with 10 per cent. of the residue from the "cooker," sent out as a sample of fish manure.

A sample gave the following analysis:—

Moisture	4·30 %
Nitrogen	3·43 %
Phosphoric Acid	1·71 %

The value of a low-grade fertilizer of this description based on present-day unit values would be approximately £3 10s. per ton, and to

make a fertilizer of this description on a large scale would not be economical. The method of manufacture practised abroad is to run the "cooker" liquid (whole brew) through a filter press, allowing the liquid expressed to be carried to the oil tanks, where after the oil is "floated" off, the liquid is allowed to run to waste, the solid portion remaining in the press being dried and sold as fish fertilizer.

The fertilizer manufactured by the Messrs. Michelson at Cunninghame is really a marl or chalk reinforced with a solution of fish glue and other soluble protein substances. Whilst this fertilizer may command a ready market locally, the handling charges are so great as to preclude profitable manufacture.

However, the advisability of adding a percentage of chalk in drying is a point worthy of consideration. This plan would have the disadvantage of diluting the fish fertilizer with a consequent decrease in value. On the other hand, the chalk addition would absorb protein substances which otherwise would run to waste, might decrease the cost of drying, with the final advantage of increasing the yearly tonnage of fish fertilizer.

The method of running the "cooker" liquid through a filter press produces a high-grade fertilizer, as the following analyses show:—

	Norwegian* Fish Guano.	Cod* Guano.	American* Dried Fish.	Sa'mon† Fish Fertilizer.	Menhaden† Scrap Fertilizer.
	%	%	%	%	%
Moisture	8·00	6·2	12·80	4·97	7·72
Nitrogen	9·00	7·3	7·30	8·70	8·43
Phosphoric Acid ..	10·00	11·83	8·30	8·31	6·70

From these analyses, together with the facts known concerning the fish manure already manufactured at Lakes Entrance, it is safe to assume that works properly installed and controlled would produce a fish manure of the following approximate analysis:—

Moisture	10 %
Nitrogen	8 %
Phosphoric Acid	8 %

The present-day market value of this class of fertilizer would be £9 9s. per ton.

In American factories the yield of oil varies from 15 to 25 gallons per ton of raw scrap, the quantity of oil and likewise its quality varying with class of fishes treated. Further, the oil content of certain fishes varies with the seasons. Oils from the larger fishes, such as sharks and stingarees, contain alcohols, and are particularly suitable for special blending. These oils are in great demand at prices varying from 5s. to 10s. per gallon.

It is perhaps worth mentioning that it is fish worthless to fishermen under existing circumstances that may be most valuable for the purpose

* H. Ingle, F.I.C., F.C.S., *Manual of Agric. Chem.*
† Bulletin 150, U.S.A. Dept. of Agric.

of fish oil extraction and the manufacture of fertilizer. Messrs. Michelson Brothers have performed several interesting experiments as to the oil capable of being obtained from sharks, stingarees, smig, &c. A shark weighing approximately 4 cwt. yielded, on crude treatment, 6 gallons of oil, and a black stingaree of 2 cwt. gave 4 gallons. The manufactured oil was sold to a Melbourne firm at 3s. 6d. per gallon.

Within certain limits the composition of the fish fertilizer will vary with the class of fish treated, and the quantity obtained per ton of raw material will be between 4 and 5 cwt.

The Raw Material Available.

This is the crucial point. The fishing industry at Cunninghame is not of great importance, and it is extremely doubtful whether the present fleet is large enough, or its owners imbued with sufficient enthusiasm, to provide the necessary raw material even for works of a small capacity. Local authorities maintain that the present craft could easily deliver 1,000 tons of fish per annum at any fish works established at Cunninghame. The point is—Will they? There is said to be craft available equal to bringing in over 20 tons of fish per trip, and instances are quoted of 20 to 30 tons of fish being obtained in one haul. It is computed that two fishermen can catch 2 tons of fish per day.

With the immense fishing grounds extending towards New Zealand and Tasmania there should not be any difficulty in obtaining the necessary raw material, but it is a moot point whether the present fishing population with its craft of to-day, even under the best conditions, would guarantee to supply 1,000 tons of fish refuse per annum at the works at a reasonable figure. It is highly probable that the price paid per ton of fish by the management of a properly equipped fish fertilizer factory would range between 20s. and 30s. The former is the price paid in Sydney.

It is not the purpose of this article to state precisely what should be done to establish the industry. The sole objective is to disseminate certain facts which might act as a guide if the installation of a factory were being considered. If a factory be established a co-operative scheme between local fishermen (or their society) and private enterprise should undoubtedly be the basis on which to build the fish fertilizer industry at the Lakes Entrance. Should such a factory be installed there will not be the least difficulty in disposing of the products. The present quote for the lowest grade fish oil is 5s. per gallon, whilst 1,000 tons of fish fertilizer could be readily placed at the approximate figure of £9 per ton, and the demand for these commodities in Australia and abroad is increasing annually.

The various grades of fish oil have many uses. Some are used as edible oils, others for blending in lubricating and lighting oils. The paint and varnish factories absorb large quantities, and they are also largely used in dressing leather. The lowest grade oils are made into fish-oil soap (a valuable ingredient in the manufacture of fungicides and insecticides) and axle grease.

(To be continued.)

TURKEY REARING.

By W. C. Rugg, Poultry Foreman, Werribee Research Farm.

The rearing of turkeys for the table can be successfully carried on in the northern areas of Victoria with less trouble and expense than is generally supposed, and many wives and daughters of settlers there are earning big sums in this way. In the Goulburn Valley, for instance, large quantities of wheat, oats, and lucerne are grown, consequently there is a good food supply, and climatic conditions are particularly favorable for this branch of poultry farming.

The essentials for success are sound, healthy breeding stock, careful feeding and management of the young birds and marketing at the right time.

Pure American Bronzewing turkeys are the most satisfactory. The breeding stock should consist of half-a-dozen hens from 14 to 16 lbs. weight, mated in their second season with a gobbler not less than twelve months old, and from 24 to 32 lbs. weight. In my experience, males of this weight are more satisfactory than heavier birds of from 36 to 45 lbs., as the latter do not fertilize so well, and frequently injure the hens. Occasionally, I have had hens so badly torn on the back as to need as many as fifteen stitches.

Although it is comparatively easy to remove the spurs of the male birds, it may be found more satisfactory to use boots. Almost any saddler will make them from a bit of green hide for a couple of shillings, and with care they will last two or three seasons if taken off at the end of the breeding season, cleaned, and given a good dressing of neats-foot oil.

The boot should be made the shape of the finger of a lady's glove, of a length equal to the bird's spur, with two small buckled straps to fasten round the leg. If a wad of sole leather (a piece out of a saddler's punch) is put inside the end of the boot, it will prevent the spur from wearing a hole in the end of it. Should the bird's spurs be very sharp, the points may be filed, care being taken not to make them bleed, and the life of the boots will thereby be prolonged.

The gobbler should be a bird of robust constitution, with good, wide shoulders, long in the breast, and short in the leg. If such a bird is mated with hens of the weight stated, tight and close in feather, offspring of a suitable size to bring the best prices in the Melbourne market should be produced.

Turkeys should be encouraged to roost in trees where possible. It is good for the birds to use their wings, as it developes the muscle and makes the breast thicker. Turkeys roosting in the open air breed strong, healthy chicks, and the greater the range the stud birds have the stronger the chickens will be.

Turkey hens always choose their own nests. The eggs should be gathered daily, one being left in the nest. It is advisable to pencil the date on the eggs, so as to make sure of leaving the new-laid one for the nest egg. The eggs, when collected, should be kept in a cool place, and turned every day.

When the hen goes broody, a coop with a run attached should be placed near the house in a sheltered position on a patch of grass or lucerne. The nest should be made by putting 2 or 3 inches of soil mixed with a little lime in the bottom of the box, and a small depression made about the depth of a soup plate by patting down the earth with the hand; then a handful of pine needles or straw should be put in. The earth must be spread fairly evenly over the whole box a little higher at the edges than in the centre, and too much straw should not be placed in the nest, otherwise the eggs may roll out. The eggs should be put in the nest, and the hen placed on them at dusk, and closed in for about 22 hours; then the sitter may be given water and food consisting of either wheat, oats, or maize. After two or three days she may be let out, and can usually be relied upon to go back to the nest after having had a dust bath and a green pick. Broken charcoal and grit should always be kept near the sitting hens. Sixteen eggs are sufficient. If she has laid more, up to nine can be put under a domestic hen, which should be set at the same time. A record of the date when the hen is set should be kept by marking it on the coop, or in such other way as is most convenient. The chickens should all be given to the turkey mother, as she will make a much better job of the rearing of them. About two days before the hatch is due, the hen should be gently lifted off and given a dusting with a good insect powder, and then allowed to feed. By the time she goes back to the nest she will have got rid of any vermin with which she may have been infested. and the chicks will get a fairly clean start. Turkeys should always be handled very gently. For this reason, womenfolk are more successful with them than men. When the chicks arrive, they do not require food for at least 24 hours, but the mother should be liberally fed on any whole grain, as she will probably not have taken any food during the last day or so of the hatching. Some powdered charcoal and coarse sand or fine grit should be placed for the young ones to pick at. Their first feed should consist of oatmeal mixed with a little milk. The drier the oatmeal is mixed the better, and it must not be sticky or sodden; only about three tablespoonfuls should be mixed at a time; a dessertspoonful of milk is sufficient to take up the flour in such a quantity and prevent waste. To this mixture should be added a little coarse sand, and a teaspoonful of powdered charcoal. In fact, up to the time they are a month old, charcoal should always be mixed with their food; after that, they will eat plenty of it of their own accord, if it be available. The first drink should be new milk. It is well to place the milk in a saucer, in which an old cup has been inverted to prevent the chickens from standing in it. New milk should be the only drink for at least three days; then water may be substituted; but new milk once a day should be given for at least a fortnight, preferably first thing in the morning. After that, separated milk will do. It would perhaps be well to mention that the more milk young turkeys get the finer will be the texture of flesh.

The coop should be moved a few feet every day to give the chicks fresh ground to run on; about the fourth day, the front of the coop should be raised a few inches to allow them to run in and out, but the hen should still be kept inside. At this age, a little finely-chopped green lucerne or lettuce should be added to the oatmeal, then chopped onions

or shallots, and silver beet, milk thistles, or dandelion, will make a good change. After a week old, a little bran and pollard may be added, and the oatmeal gradually lessened till the young ones are a fortnight old, when it may be dropped altogether.

At the age of three weeks, a mash made of bran, mixed with water in which rabbits or liver have been boiled, and dried off with pollard, may be given them. To this chaffed green lucerne, rape, or other green stuff should be added. To prepare this mash, the bran should be placed in the trough and scalded with an equal measure of the soup, a bag being placed over it to keep in the steam for 10 or 15 minutes. Then pollard, equal to about twice the quantity of bran used, will be necessary to dry the feed off to a nice crumbly mixture. The green stuff can be mixed with the feed after the pollard.

Only as much as the birds are likely to pick up should be prepared. It should be fed in troughs, or on a clean bag spread on the ground, so that any food not eaten may be taken away and not left to go sour.

The chicks should be fed five or six times a day for the first three weeks. During this time, a little cracked grain may be fed to them at night. When they are a bit older, three or four feeds a day will suffice. At the end of six weeks, whole wheat and oats may be given. Cracked maize is also beneficial.

The changing of the feed should be done gradually; many a promising brood have been lost through neglect of this precaution.

Young turkeys should not be let out of their shed till the dew is off the grass. I have watched young turkeys feeding along an irrigation channel often wading half way up their breasts in water after insects, &c., and no harm resulted, but if they are allowed to run in damp grass and get wet across the back, it very often proves fatal.

They should be frequently examined for vermin, especially about the head. If any are found, a good plan is to get a small oatmeal bag, put therein some good insect powder, place a little one in it, and shake gently. This operation takes only a few seconds, and well repays the trouble.

I am indebted to Mr. Hart, the Chief Poultry Expert, for many hints on turkeys. On one occasion, he drew my attention to the very rapid growth of the flight feathers of young turkeys. This is, no doubt, a provision of nature to aid the young turkeys in fleeing from their enemies, as when frightened they use these feathers at a great rate to increase their speed. Mr. Hart suggested that if this growth (unnecessary under domestic conditions) could be diverted into the young bird's body a great improvement could be looked for. I decided to try the experiment on a few chicks, and when they were ten days old removed the six flight feathers of each wing. Chickens treated in this way developed quickly, and since then I have similarly treated hundreds, and am convinced it is a great help to them during a very critical period.

In performing the operation, great care has to be used not to injure the wing, but if the chicken be placed in the palm of the hand, and the wing held firmly between the finger and thumb, the feathers can be easily pulled out without any injury.

When the young birds are ten or twelve weeks old, a trestle frame should be made about 2 feet from the ground for them to learn to perch on. The perches should not be less than 2 inches wide, and if placed near a tree, the birds will soon learn to get into its branches. From this time on, they should always have a full feed of grain at night.

Three weeks before marketing, they should be fed on grain which has been soaked in milk for from sixteen to twenty-four hours. Some people prefer to give them boiled wheat or barley, but I think the former the better feed.

Many make the mistake of sending their birds in for sale before they are ready. It is well to remember that it is not so much size that counts with the buyer as condition. A plump, well-conditioned bird of 20 lbs. will always sell better than a large-framed, poor bird, even if he weighs a few pounds more.

It is wise to pick a reliable salesman and to send all birds to him. If birds are in good condition, he will be able to recommend them to his best customers to the seller's advantage; and once a person has acquired a reputation for sending only first-grade birds, buyers will always be on the look out for his consignments.

THE POULTRY INDUSTRY IN 1921.

By A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

"What are the prospects for next year?" was a question put to me recently by the owner of a flock of slightly over 2,000 birds, and with the hatching season now commencing, it must be the uppermost thought in the minds of most poultry breeders. In the June number of the *New Zealand Journal of Agriculture* is a very educational article by Mr. F. C. Brown on the cost of feeding pullets to six months old, by which time, of course, they should be in full lay. The actual cost per pullet for feed alone worked out at 6s. 11¼d., with wheat at 6s. 8d. per bushel, pollard £9 5s. per ton, bran £7 5s. per ton, pulled oats 4s. per bushel, rolled oats £35 per short ton, and oatmeal £27 per short ton.

The article referred to is reprinted below:—

During the past season a trial was conducted at the Milton Poultry Station to ascertain the cost of feeding pullets to the age of six months. Sixty White Leghorn chickens were placed in brooder. Of these, seven died when a few days old, and of the remainder twenty-nine proved to be pullets and twenty-four cockerels. The cockerels were separated from the pullets when they had attained a weight of about 3½ lb., and the available market price for these—4s. each—was credited to the pullets, while the whole cost of feeding was charged against the pullets.

The following are particulars and actual cost of the food supplied to the chickens during the six-months period of the test:—

	£ s. d.	£ s. d.
Whole wheat, 1,008 lb., at 6s. 8d. per bushel		5 12 0
Cracked wheat, 187 lb., at 6s. 8d. per bushel	1 0 9	
Add cost of cracking ..	0 1 6	
		1 2 3
Crushed wheat, 112 lb., at 6s. 8d. per bushel	0 12 5	
Add cost of crushing ..	0 0 9	
		0 13 2
Pollard, 769 lb., at £9 5s. per ton ..		3 11 2
Bran, 254 lb., at £7 5s. per ton		0 18 5
Oatmeal, 26 lb., at 6s. 9d. per 25 lb. bag ..		0 7 0
Hulled oats, 264 lb., at 4s. per bushel ..	1 6 5	
Add cost of hulling ..	0 6 7	
		1 13 0
Rolled oats, 45 lb., at 35s. per 100 lb. ..		0 15 9
Meat-meal, 21½ lb., at 20s. per 100 lb. ..		0 4 4
Total		£14 17 1
Deduct price realized for twenty-four cockerels sold at 4s. each		4 16 0
Net total cost		£10 1 1

Dividing this sum by 29 (the number of the pullets reared), the average net cost of food for one pullet works out at 6s. 11¼d.

During the six months eggs to the value of £1 8s. 6d. were laid, but no credit is allowed for this amount, it having no bearing on the object of the trial.

NOTE.—The above-recorded experiment was carried out at the request of the New Zealand Poultry Association.

It will not be possible in Victoria to obtain feed cheaper this season than at the figures quoted, and in all probability we shall see wheat dearer next year. Consequently, counting in labour and use of equipment, pullets will be worth about 10s. each to the grower by the time they come in lay, and their cost of feed during their laying year will be fully 3d. per bird per week. It follows, therefore, taking into consideration labour, feed, housing, and equipment, interest on capital, and depreciation in value from pullet to second season hens, that each bird will cost not less than £1.

How much will each bird earn? Quite recently, one of the metropolitan daily papers in an article on the cost of living, singled out the egg market for special attack, and advised the public to hold off buying eggs so as to reduce the price. The article, so far as eggs are concerned, was distinctly misleading, as they sold at from 3s. to 3s. 3d. retail, and 2s. 6d. wholesale from 29th April to 15th June, then the price fell 8d. per dozen in ten days, which represents the customary seasonable fall for the time of year, as is shown in my article, "Fluctuations in the Egg Market" in the *Journal of Agriculture* for February, 1920, page 116. The price recovered 6d. per dozen by 8th July.

There is considerable danger for the future of the poultry industry unless all producers co-operate to secure a fair price for their products based on the cost of production. Let us take the case of a man with a flock of 1,000 White Leghorns in the month of June. Out of the 1,000 birds, fully 250 will be second-season birds not yet through the moult, and consequently not laying. There will also be a certain number of male birds, leaving about 700 pullets. These pullets will lay about 300 eggs per day, *i.e.*, 750 dozen eggs for the month. The feed bill may be taken as being 1s. per bird per month.

At the present time 11s. 9d. per day is the basic wage of the lowest grade railway porter, and may therefore quite fairly be considered the minimum wage for a poultry farmer, so that six days a week at 11s. 9d., and time and a half for Sunday—poultry farmers must work Sundays and Saturdays alike—represents £4 8s. 1½d. a week for the poultry farmers' wages, light help at 30s. a week, and interest on capital, depreciation, rates, &c., £100 a year. The balance-sheet for the 1,000 bird poultry farmer for June would therefore be as follows:—

	£	s.	d.
To interest on capital, depreciation, rates, &c., at £100 a year	8	6	8
To wages, self, £4 8s. 1½d. week	18	17	8
To wages, light help, at 30s. per week	6	8	7
To foodstuffs, 1,000 birds at 1s. each	50	0	0
To marketing and commission on 750 dozen eggs at 1¼d. per dozen	3	18	1
Balance	6	4	0
	£93	15	0

	£	s.	d.
By 750 dozen eggs at 2s. 6d. per dozen	93	15	0
	£93	15	0

The poultry farmer, therefore, during the month of June, obtained a net profit of £6 4s. on 750 dozen eggs at 2s. 6d. a dozen, which represents an actual profit of 2d. per dozen. No one can, therefore, accuse the poultry farmer of profiteering, and it becomes more obvious as time goes on how urgent it is that the public should be educated up to paying higher prices for poultry products, failing which many breeders will seriously curtail production.

Fortunately, after a somewhat alarming dry spell abundant rains have fallen, and the crop prospects are reported to be far more hopeful. It is most unwise to prophesy, and probably no one can say what the actual cost of foodstuffs used as fowl feed will be in 1921, although they will most likely be higher than at present. However, I feel confident that if the breeders will first and foremost co-operate, and secondly avoid all late hatching, the prospects for the 1921 season will be brighter than they have been for some years past.

The importation of eggs by Great Britain for 1919 was 56,443,950 dozen, as compared with 26,564,150 in 1918, and 215,799,500 in 1913—according to the latest figures from the Journal of the Ministry of Agriculture for March, 1920. The values of the foregoing quantities being declared, respectively, at £8,613,326, £4,621,649, and £9,590,602 The average values per dozen for imported eggs, therefore, were 3s. 0¾d. in 1919, 3s. 1¼d. in 1918, against 10⅔d. in 1913. It will be seen, therefore, that the importations for last year were only about 26 per cent. of the pre-war figures, although the price per dozen had largely increased.

One of the principal reasons for the fall in quantity, due to the cessation of supplies from Russia, which sent 114,532,770 dozen in 1913, or slightly over half the total number of eggs imported for that year by Great Britain.

Canada sent 14,769,620 dozen for 1919, as against 3,889,850 in 1918, and the United States 14,086,060, as against 3,373,450 in 1918.

The quantities from Denmark are as follows:—16,380,670 dozen for 1919, 11,705,350 in 1918, and 42,650,000 for 1913. The population of Denmark is only twice that of Victoria. When will the Victorian breeders see their way to forget petty differences, and co-operate to secure a share of this enormous market awaiting them overseas?

FARM NOTES FOR JUNE.

NOTES ON EXPERIMENTAL WORK, STATE RESEARCH FARM, WERRIBEE.

(*George S. Gordon, Field Officer.*)

Seasonal Conditions and Seeding Operations.

Seeding operations on the Experimental Fields were completed on 24th June, with the exception of a few plots reserved for late seeding tests. In addition to the usual plots, a few have been sown with electrified seed, and others are being used to test the value of a material from France called Physiological Fertilizer. The work extended over a long period, during which light showers (amounting to 222 points in May and 137 points in June) fell, but there were few interruptions on account of wet weather. On the whole, germination has been good, and the showers have helped the growth of the young crops. The germination has been excellent, and the crops have been assured a good start.

Top-dressing Lucerne for Winter Feed.

The top-dressing tests on the irrigated lucerne field at Werribee have shown striking increases on the yields of hay obtained from the manured plots. During the past month, the greater winter growth on some of the top-dressed plots has also stood out in marked contrast

with that on adjoining areas which did not receive fertilizers. The best of the plots are specified in order of merit hereunder:—

1. Plot which received 10 tons of farmyard manure and 20 cwt. of lime per acre.
2. Plot which received 10 tons of farmyard manure per acre.
3. All plots receiving 2 cwt. of superphosphate per acre; particularly when in conjunction with (*a*) gypsum, (*b*) lime, and (*c*) ground limestone, at the rate of 20 cwt. per acre.

The area which received superphosphate 2 cwt. and gypsum 20 cwt. per acre was apparently the best of those in section 3. On these the growth was quite double that on the untreated plots; and when one considers the value of the extra herbage for lambing ewes or other stock, at a season when "feed" is usually scarce, the importance of economically increasing the carrying capacity by supplying suitable fertilizers is at once apparent.

When sheep were admitted to the field, it was noticed that they ate out the growth on the top-dressed sections first. This probably indicates that it was more palatable or nutritious than that on the untreated plots, but no comparative feeding tests were carried out.

Most of the lucerne areas at the State Research Farm are "cut" in spring, summer, and autumn, and grazed at intervals during the five months—April to August—in which the crop is comparatively dormant. Careful records, taken during the past few years, show that in the grazing periods referred to, the field in which the plots mentioned are located carries stock equal to about five sheep to the acre. This field has an area of 50 acres, most of which is top-dressed with 2 cwt. of superphosphate per acre each year; but it also contains over 4 acres of untreated check plots.

Farmyard manure and the labour involved in spreading it are not always available on the average irrigation farm, but where the work can be carried out it would seem that this manure can be very profitably used on lucerne. Two cwt. of superphosphate can be economically distributed by the ordinary drill, after the winter renovation. This quantity has proved so profitable on the Research Farm that a section has been set apart to test the value of doubling the application; and it is interesting to note that, with 4 cwt. of superphosphate per acre, it gave the greatest yield of dry hay from any plot last year. The area was cut four times, and the total weight of hay harvested was 4 tons 7 cwt. per acre, as against 3 tons from a similar number of cuts on the unmanured plot.

Other fertilizers and lime in its various forms may be used with advantage as top-dressings for lucerne, but the experiments at Werribee to date go to show that to obtain a quick and profitable return for the smallest outlay of capital and labour, there is nothing equal to superphosphate.

Winter is the time to renovate and top-dress lucerne.

Do it now.

EXPERIMENTAL FARM, RUTHERGLEN.

(P. B. O'Keefe, Manager.)

The weather for the month has been all that could be desired, a total rainfall of 379 points having been registered. This was made up by gentle soaking falls at regular intervals, during which mild temperatures prevailed. In consequence of these favorable conditions grass has made fair growth, and crops have done remarkably well. Water supply in dams has been replenished. There has been some mortality among stock, but losses are slight compared with what might have occurred if typical June weather had been experienced. Ewes throughout the district are lambing, and in some cases where feed is scarce are reported to be deserting lambs and allowing them to perish. The later lambs will have a much better chance than those dropped early.

Many farmers are still busy planting crops, but the majority have finished. Crops planted since the 1st June have come through, and are making rapid growth.

Cultivation.—The planting of cereals has been completed. An area of 630 acres is overground on the farm apart from experimental area. Fallowing will be gone on with at an early date; all fallows will be sown with rape, and later with millet as a catch crop.

Dairy Herd.—Produce to the value of £1 17s. 6d. per cow has been disposed of for the month. In anticipation of a rise in the price of beef fat cattle have been held over, and will be sold in the near future at a price considerably in excess of previous estimate. Fodder consists of oat silage along with paddock and green crop pasture.

Sheep.—The cross-bred flock has commenced to lamb. At present ewes are being grazed on young oat crops, but this will be discontinued after 15th inst., except on those fields planted for grazing.

Pigs.—Twelve young cross-bred pigs, born on the 31st May, have done very well; they now turn the scale at an average weight per pig of 22½ lbs. The boars have been castrated, and all will be weaned at six weeks old, and divided into even lots of four for experimental feeding. They will be weighed weekly.

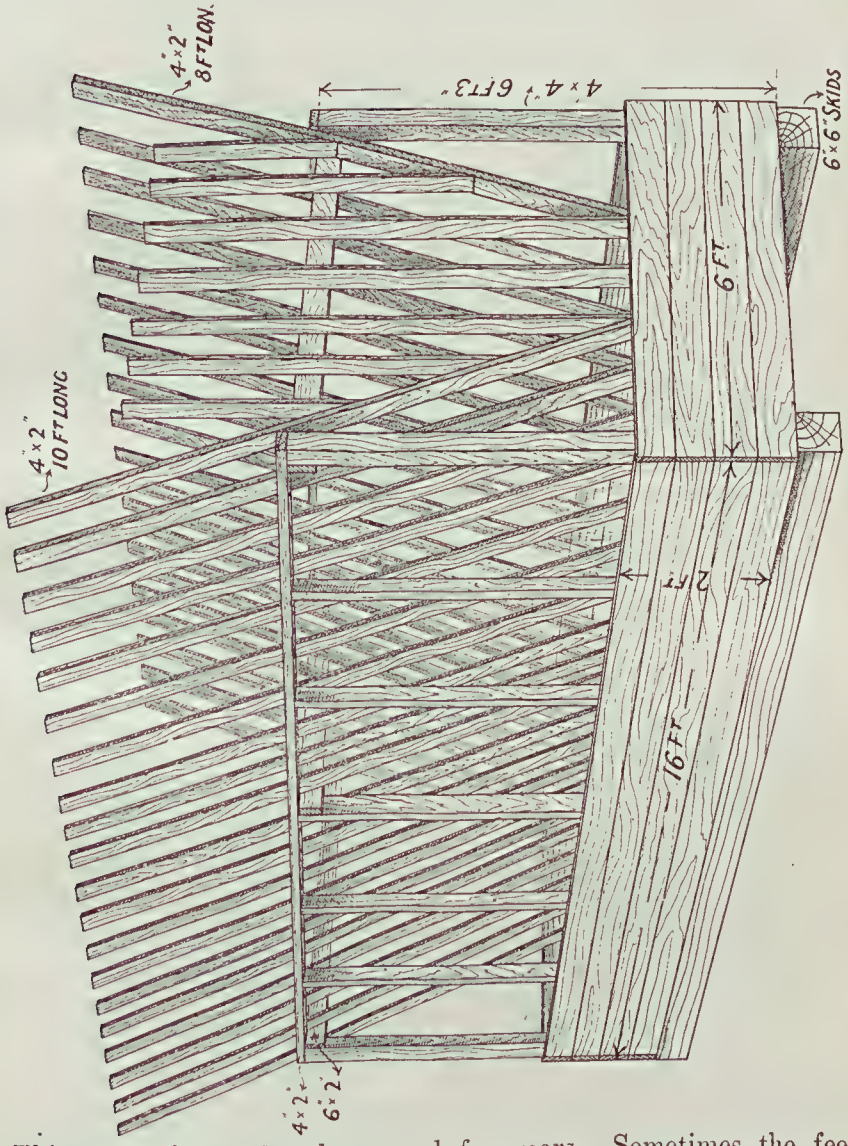
Two large York sows past breeding were sold at Wangaratta market as back fatters; the live weight of the two was 1,400 lbs.; the prices realized were £18 2s. 6d. and £18, which is a record.

Cross-bred pigs are still doing well; their live weight at six months old averages 185 lbs. each. It is intended to dispose of them on the 13th July, when their dressed weight should be from 130 to 140 lbs.; if, however, our weighings indicate that it will be profitable to keep them longer they will be held back for a further fortnight.

The pure-bred pigs being fattened have done much better latterly, but still have a lot of leeway to make up.

FEED RACK FOR CATTLE.

The plan of a feed rack illustrated hereunder is taken from a pamphlet issued by a United States Agricultural Experiment Station. The rack is mounted on skids made of 6-in. x 6-in. material. It is 16 feet long, 6 feet wide at the base, and the box 2 feet high. Besides the 2-in. x 6-in. cross-pieces at the ends, which tie the sides together, and to which the 2-in. x 4-in. uprights at the end are nailed, there is a cross-piece that ties the sides together at the centre.



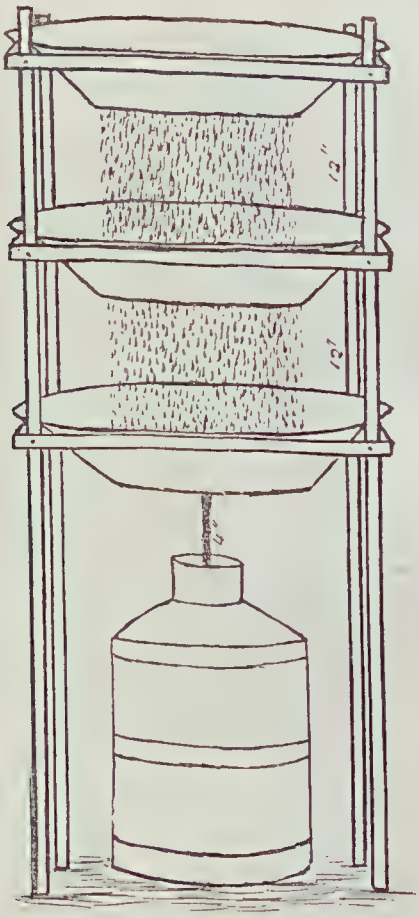
This type of rack has been used for years. Sometimes the feed arches after being eaten from below, would require to be pushed down.

In country where high saplings are available, the cost of construction may be considerably reduced by substituting these for some of the sawn timber.

MILK COOLING.

The accompanying illustration of a Milk Cooler, designed by Mr. Alex. Stewart, of Ballan, is reproduced from the Bacchus Marsh *Express*.

It is claimed that by the use of this cooler milk can be so cooled that it may be kept with safety in the can on the hottest nights, and that, in



addition, the cooling will expel the strong odours sometimes noticeable in milk from cows fed on rich pastures or rank growth of weeds.

The dishes in the coolers should be placed about 12 inches apart, the lower one about 4 inches above the milk can. The cross-bars, on which the dishes rest, should be about an inch and a half shorter than the width of the dish. The two lower dishes may be placed in position

from the top of the stand. The two upper dishes should have sufficient small holes punched in the bottom (by means of a nail) to allow the milk to escape at a rate corresponding to that at which it is milked. Mr. Stewart says he has found that with very large milk dishes one cooler will suffice for two milkers.

When in use, the coolers should be placed in a shady spot where there is a free circulation of air.

The following comment on the above is made by Mr. J. S. McFadzean, Senior Dairy Supervisor:—

When cooling it is also most advisable that the milk be kept protected from both flies and dust. The good done by cooling will be largely discounted if the milk should become contaminated during the process by flies or dirt, for its keeping qualities will thereby be altogether destroyed. Dirt is the greatest trouble that distributors and others handling milk have to contend against. Dirt hastens the formation of acid in milk, and the souring of the whole immediately follows. With cleanly methods of handling, the cooling of milk as soon as it is drawn from the cow is the very best thing that can be done to allow of its being distributed to the consumer in a wholesome condition. The more slowly milk is run in cooling the more effective the aeration will be, particularly if the surrounding air be cool and all contamination guarded against.

AGRICULTURAL CO-OPERATION IN ENGLAND.

Some account of the striking development of agricultural co-operation in England during the last year will be of interest to the wider circle of agriculturists. Much was heard of the word "reconstruction" during the last stages of the war and for the first few months following it, but it is difficult to point to any achievement in this direction in most departments of national life. It is pleasant to be able to say that agricultural co-operation is an exception. The progress made during the past twelve months has been little short of phenomenal compared with the previous rate of growth.

Prior to the armistice, besides a certain number of co-operative dairy societies, some co-operative slaughter-houses, and a large number of small societies dealing with eggs, poultry, fruit, market gardening, and allotments, there were only six or seven large co-operative farmers' societies for the purchase of raw materials (feeding stuffs, fertilizers, seeds, machinery, &c.), which covered but a fraction of the country. In other districts there were either under-capitalized and struggling societies or no societies at all.

The prospects of English farming after the war have been by no means clear. There has been an unstable market in farmers' requirements and a feeling of uncertainty as to what will happen when control

is removed in the various branches of the industry. The introduction of the minimum wage and of standardized working hours into agriculture has introduced a factor the future effect of which it is impossible to calculate. The prospect of severe competition from imported food is always present in the farmer's mind. In spite of governmental assurances, the farmer is for all these reasons justly apprehensive as to the future of his industry, in some cases even to the extent of fearing a return to the hard times experienced between 1880 and 1900.

The result has been to make him incline his ear favorably to the claims of co-operative trading, which leads to a real economy in production and a more advantageous system of marketing his produce. The fact that most other businesses have during the war made themselves strong by amalgamation and combines has helped in this process, for nowhere are there more combines, rings, and cartels than in the agricultural trade.

The position was admirably put in a letter to a leading farming paper recently: "What is and has been," asks the writer, "the position of the isolated independent farmer working his business as a private trader? He buys a machine here, an implement there, a few tons of cake or artificial manure somewhere else, a few quarters of seed and feed corn, or a few bushels of small seeds, and so on, in another place. These have all to be sent separately, and naturally expensively. To express the matter in a sentence, he is buying retail and at a retail figure. But when he goes to sell his produce, the boot is on the other foot; he has to sell to the miller, to the merchant, or to the butcher wholesale, so that the individual farmer, working, selling, and buying as a private trader, is buying in a retail market and selling in a wholesale one. But as one of a body of farmers under co-operation he has means in his hands of buying, as well as selling, wholesale."

During the year, the Agricultural Organization Society, the non-trading and non-political central organization of the agricultural co-operative societies in England and Wales, has held nearly 300 meetings all over the country to make the farmers' co-operative movement national in its scope. Its principal aim has been to establish in every country one or more large and well-capitalized societies for the purchase of the farmer's requirements and the sale of his produce, and in the case of counties where societies already exist, to get them strengthened by increase of capital and unified by amalgamations.

This campaign met with instantaneous success. During the past eighteen months, societies have been formed in the following counties:—Northumberland, Durham, Cumberland, Yorkshire, Lincolnshire, Nottinghamshire, Warwickshire, Herefordshire, Devonshire, Cornwall, Somerset, Dorsetshire, Buckinghamshire, Surrey, and Kent. Some of these societies aim at covering the whole of their respective counties. In other cases, the counties were already partially covered, or in the case of the larger counties more than one society has been found necessary. Besides these new societies, in certain counties, such as Staffordshire, Derbyshire, and Leicestershire, amalgamations have taken place, and elsewhere the older societies have vastly increased their membership and capital.

The leading farmers through England now take great interest in the movement, and the most prominent feature of the campaign has been the readiness of farmers to subscribe sufficient capital, in most cases £20,000 to £50,000, to start their own society on a thoroughly sound basis, and be able to afford the best brains in the agricultural trading world for their management.

In January, 1920, the societies affiliated to the Agricultural Orzanization Society included 469 trading societies dealing in farm requirements and produce, and 920 small-holders and allotments societies. Over one-third of the farmers in England and Wales hold shares in these societies, of which the annual turnover exceeds £10,000,000 sterling.

All societies are, of course, formed under the Industrial and Provident Societies Acts. Share capital is limited to £200 per member; interest is limited to 5 per cent. or 6 per cent. A co-operative society exists to make savings rather than profits, but any profits that arise after payment of interest, &c., and adequate provision for the reserve fund are divided on the well-known co-operative principle, *i.e.*, in proportion to the business which each member has done with his society.

A further enlightening fact is that the Agricultural Wholesale Society, formed two years ago to act as the co-operative wholesale society and the control trading body for agriculturists, has had a growth commensurate with the growth in the counties. It is equipped, not only to buy farm requirements in bulk, whether at home or overseas, for distribution to the individual societies, but also to dispose of their united produce in the great markets of the world. The whole of its shares are owned by the agricultural co-operative societies in the country, and its profits go back to the member societies in proportion to the volume of their trade with it.

—*Rhodesia Agricultural Journal*, May, 1920.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

PRUNING.

Pruning operations will now be in full swing. In pruning the young trees, heavy pruning will be required in order to produce strong growths and a good frame, but as the tree advances in age the pruning will be reduced considerably. It should be remembered that strong, heavy pruning results in wood growth, and that weak pruning steadies the tree, and promotes an even growth. When framing and building a tree, the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree be in a healthy condition; so that when trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Old fruiting wood, and dead and dying wood should always be removed, and aged spurs should be considerably reduced, in order to make them produce new growths. Crowded and overlapping laterals should be shortened back; fruit-bearing in the higher portions of the tree should not be encouraged; and due consideration should be given to the admission of light and air to all parts of the tree.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be pruned so that they will not produce too heavy a crop in the fruiting year; and at the same time they will produce wood in their fruiting year to give a crop in the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portions of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

DRAINAGE.

The rains of winter will always show the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer. If the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by the loss of roots through rotting, or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only surplus or excess when it is in the soil. Two circumstances, and two only, permit of surface drainage. First, when it is necessary to carry

away excessive stormwater; and, second, when it is practically impossible to find an outlet for under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains, which, owing to their depth, act also as soil drains; neither does it apply to graded surfaces which allow a more equitable distribution of water. Surface draining is usually applied to a system, whereby a considerable quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in a few inches of surface soil. Their feeding area is thus extremely limited indeed; and when, at any time, rain-water does filter and penetrate through the soil, it carries with it the soluble and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into the soil, the soil temperature is rendered far more equable, warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. When natural drainage occurs, the orchardist is fortunate; but whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their term of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results. They are also less liable to silting up than any other material.

Drains should be placed into the clay, if this be not too deep. In any case, they should be below any possible interference from cultivating instruments.

Spraying.

In order to keep in check such pests as Bryobia, scale insects, woolly aphis, and others, a strong and forcible spraying with lime sulphur or red oil spray should not be delayed any longer. The whole tree should be thoroughly wetted with the spray. A good, vigorous, and thorough winter spraying will place a large majority of the trees in quite a satisfactory condition of freedom from these pests for the whole year.

The lime sulphur spray is an excellent fungicide, and a strong winter spray will go a very long way in reducing any attack of the black spot fungus on either the apple or the pear. In addition, if the

peach trees are sprayed at this time with lime sulphur, both peach aphis and peach leaf curl will be considerably minimised in the spring time.

The Flower Garden.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or stable manure, and subsequently these should be dug well into the soil. Care must be taken not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap they should always be dug into the soil. Leaf-mould is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects. The plants mentioned above strongly object to lime.

All shrubs that produce flowers on their young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood and those that flower on the wood of the past season's growth. Those that flower on the new wood, and may now be pruned, are Lantana, Cestrum, Tecoma, Hydrangea, Plumbago, Erythrina (some species), &c., and those that should not be touched at present time are Spirea, Erythrina (some species), Pyrus Japonica, Weigelia, Prunus pissardi, P. Vesuvius, P. mume, Deutzia, Polygala, Ceanothus, &c. It is a safe rule in pruning shrubs to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants, such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum, should be cut back, and, if necessary, lifted and "heeled in" in a temporary location for the winter. Plant out early Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

The Vegetable Garden.

Seedlings from boxes or seed plots may now be planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil, and thus deepening the paths and the spaces between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted; sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

REMINDERS FOR AUGUST.

LIVE STOCK.

HORSES.—The feeding and general management of horses recommended for July will also apply for this month. Horses, more especially young ones, running on low-lying country are liable to become affected with internal parasites. This will be recognised by the unthrifty and poor condition of the animals; in such cases medicinal treatment will be necessary. If the following lick be made available, it will not only be of great assistance in preventing serious invasion, but in cases where worms are not in large numbers, the repulsion of them from the intestinal tract will result:—

Lick.

20 parts salt.
10 do. lime.
1 do. sulphate of iron.

If possible, be with mares at foaling, so that the navel cord may be properly tied and thoroughly treated with antiseptic, and thus prevent that very fatal disease, navel or joint ill. Wash cord with one part of corrosive sublimate to 3,000 of water, and soon after paint with tincture of iodine. The iodine treatment must continue till the cord has completely dried up.

CATTLE.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland:—Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¼ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

PIGS.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Crushed wheat from Wheat Board is the cheapest food available now. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

SHEEP.—Decide on the breed and number of ewes and rams required for the coming season. Place orders as soon as possible. Breeders can then give better satisfaction, and allot preference to the earlier applications. The result of mating should be given most careful consideration from a wool point of view. Evidence points to an extreme shortage of good merino and fine cross-bred wool for years to come. At the same time, a steadily increasing demand has set in for materials manufactured from these finer grades. The world's civilian requirements must be met, and for flannels and finer materials for temperate and cold climates these are indispensable. After all coarse wools have a limited use. Cull stud ewes

carefully, especially merinoes, consider form as well as evenness of covering and style of wool. Discard for thin fribby forearms, for coarse common thighs, for mushy wasty undercovering, inferior patches across the shoulders, common and short between the hip bones, narrow frames, and weak necks. Individual merit must be considered first, pedigree alone is not sufficient.

POULTRY.—Yards should be turned over with a spade or fork, and sown down with rape or barley. Keep the breeders busy—straw litter with a little grain scattered about will make them exercise. Overhaul incubators; see that the capsule of thermostat acts properly; thoroughly clean lamps, egg drawers, and chimneys. Test machine for two days before putting eggs in. It is also advisable to have thermometer tested. When additional incubators are required, it is more satisfactory to keep to the one make.

CULTIVATION.

FARM.—Second fallow where necessary for summer crops. If required, roll or harrow crops. Plant very early potatoes in forward districts. Sow mangolds. Apply slow-acting fertilizers, such as blood and bone manures, for maize.

ORCHARD.—Complete planting and pruning of deciduous trees. Watch for peach aphis, and spray with tobacco solution, if present. Prepare for planting citrus trees. Spray for woolly aphis with lime sulphur or red oil spray.

FLOWER GARDEN.—Finish digging and pruning of roses, &c. Leave pruning of shrubs till after flowering. Keep weeds in check; weed out seed beds. Divide and plant out all herbaceous plants, such as phlox, delphiniums, rudbeckia, &c. Plant out gladioli. Complete planting of shrubs. Mulch young plants.

VEGETABLE GARDEN.—Top-dress asparagus beds; plant new asparagus plots. Plant herb divisions, and potatoes. Sow cabbage, cauliflower, peas, carrots, beans, radish, and lettuce seeds. Sow tomato seeds in a hot frame. Finish digging.

VINEYARD.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before end of month, at latest. Conclude pruning and tie down rods. Where black spot has been prevalent, apply first acid iron sulphate treatment. Owing to the dry spring, black spot was not in evidence last season. The fungus is not dead, but dormant, hence preventive treatment must not be neglected. Leaflets dealing with black spot and its treatment will be supplied on application.

Cellar.—Rack again, towards end of month, wines which have as yet only been once racked (spring racking). Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.

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M.L.M SPECIALIZED FOODS provide a properly-balanced ration, and therefore maximum production, vigor, growth, and health.

Agents: **Messrs. Harrisons, Ramsay Pty. Ltd.**
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Write for Booklet on Scientific Feeding M.L.M Stock Foods D.H. Dept.

Meggitt Limited

HEAD OFFICE 76 KING ST SYDNEY (Works: Parramatta)

"The boy on the bag guarantees quality"

THE SEAL OF QUALITY

All ingredients used in the manufacture of M L M Specialized Stock Foods and M L M Tonic Meals must measure up to our established specifications.

It is not sufficient that they are the best procurable. Every component part of M L M Stock Food and M L M Tonic Meal must satisfy our rigid scientific and practical tests for nutritive values.

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"The boy on the bag guarantees quality"

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OATMEAL, SPLIT PEAS, and
PEARL BARLEY MILLERS
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BUYERS of OATS, PEAS, BARLEY, and MAIZE.

SEND SAMPLES OF YOUR GRAIN TO US.

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Up to two-thirds of valuation in sums from £50 to £2,000, repayable by instalments spread over a period of 27½ years. Interest 6 per cent. per annum.

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NO CHARGE FOR MORTGAGE DEED

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State Savings Bank,
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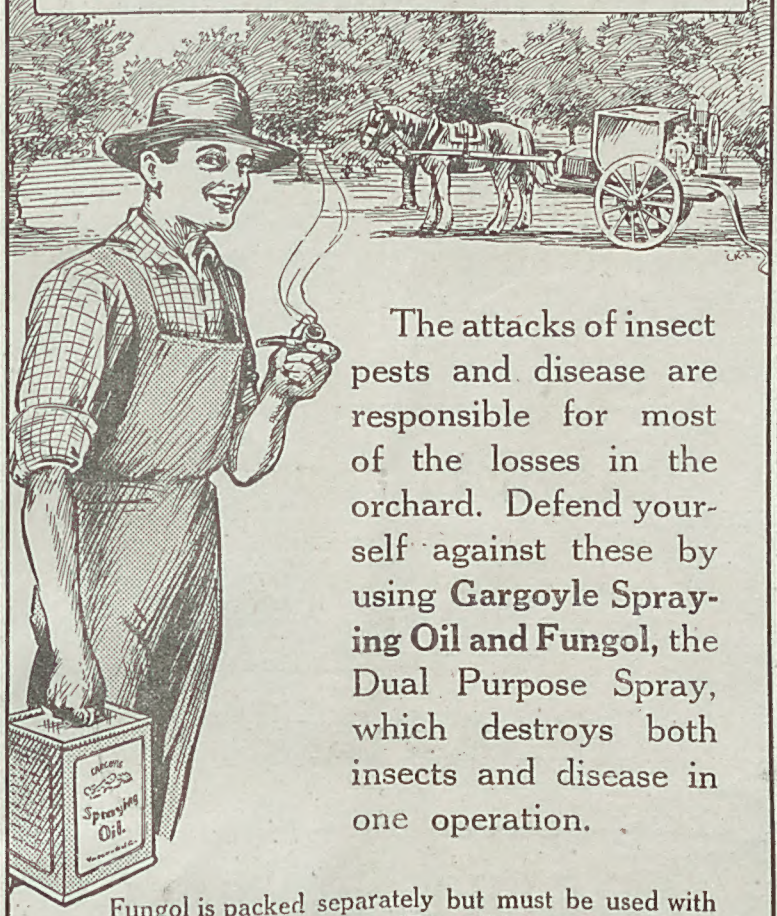
GEO. E. EMERY,
Inspector-General

The Orchardist's Defence



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Fungol is packed separately but must be used with GARGOYLE SPRAYING OIL.

EASY TO MIX. *EASY TO USE.*

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Write us for free descriptive booklet, "The Care of Your Orchard."

FUNGOL
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VACUUM OIL COMPANY PTY. LIMITED.

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Made in Australia

BLUESTONE

(Copper Sulphate)

Made in Australia

E.S.A. High-Grade Bluestone for Spraying, Pickling, and Battery Purposes

Approximate Analysis—Copper Sulphate 99.15 per cent.

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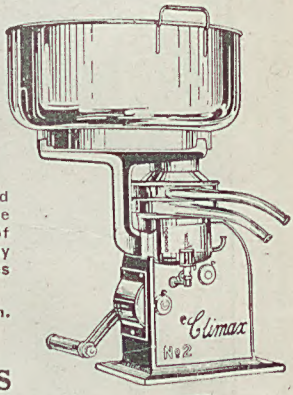
A "CLIMAX" in your Dairy means Money in your Pocket!



The "Climax" is built by highly specialized labour in the largest separator factory in the world, and is the result of many years of experience and practical test. This is why the "Climax" stands ahead of other machines in respect to—

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Handbook of Potato Diseases in Australia—and their Treatment

By D. McALPINE,

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With Appendices by W. Laidlaw, B.Sc. (Biologist), on **Eel Worms;** and C. French, Jnr. (Government Entomologist), on **Insect Pests of the Potato.**

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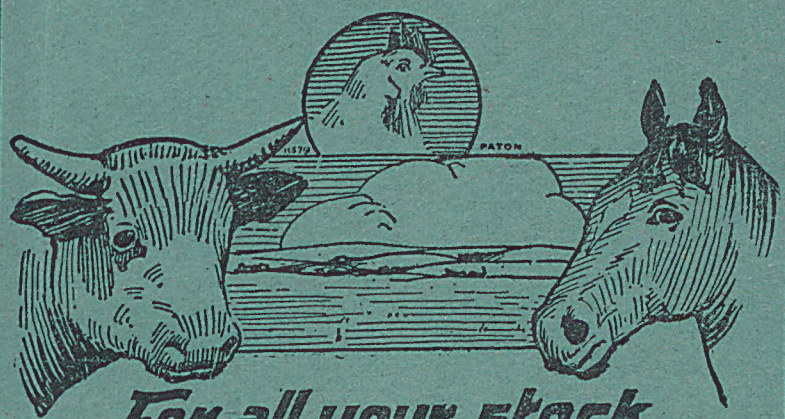

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"Polly" Brand Feed

"POLLY" BRAND FEED is just maize with the germ and surplus starch removed, toasted and made appetising, then disintegrated into powder and put up ready for mixing and immediate use. Is rich in Protein, viz., 20 per cent. guaranteed.

COWS fed on "Polly" Feed will yield 20 per cent. more milk.

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CALVES thrive on **"OIL MEAL"** better than any other.

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FATTENING PIGS.—For fat bacon nothing is more successful for weight and flavor.

MAIZE OIL MEAL differs from our "Polly" Brand Feed in that the latter is cheaper and produces bone and muscle, whereas Maize Oil Meal produces bone, muscle, fat, and a glossy and beautiful coat.

"MAIZE OIL MEAL"
Put up in 100-lb. bags.

"POLLY" BRAND FEED
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DEPARTMENT OF AGRICULTURE

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Price, £2 2/- per Sitting (16 eggs)

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